City of San Diego

CONTRACTOR'S NAME: ERICKSON-HALL CONSTRUCTION CO.
ADDRESS: 500 Corporate Dr, Escondido, CA 92029
TELEPHONE NO.: (760) 796-7700 x107 **FAX NO.:** (760) 796-7750
CITY CONTACT: Lisa Nguyen Contract Specialist, Email: LTNguyen@sandiego.gov
Phone No. (619) 533-3435, Fax No. (619) 533-3633
R. Jadan / R. W. Bustamante / LJI

BIDDING DOCUMENTS

e - Bidding

FOR ORIGINAL

FIRE STATION NO. 5

BID NO.:	**K-16-6141-DBB-3-C-A**
SAP NO. (WBS/IO/CC):	**S-00788**
CLIENT DEPARTMENT:	**1912**
COUNCIL DISTRICT:	**3**
PROJECT TYPE:	**BC**

THIS CONTRACT WILL BE SUBJECT TO THE FOLLOWING:

- THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM.
- PREVAILING WAGE RATES: STATE ☒ FEDERAL ☐
- APPRENTICESHIP

BID DUE DATE:

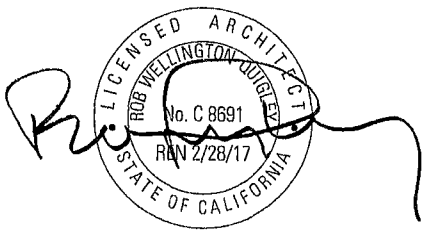
2:00 PM
APRIL 7, 2016
CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
1010 SECOND AVENUE, 14th FLOOR, MS 614C
SAN DIEGO, CA 92101

ENGINEER OF WORK

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

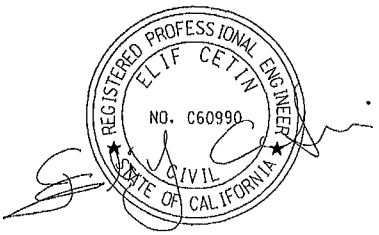
2-19-2016

1) Registered Architect — Date — Seal:



2/19/2016

2) For City Engineer — 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 No. 5. 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 website: http://www.sandiego.gov.

3. **ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is **$6,300,000.**

4. **BID DUE DATE AND TIME ARE: April 7, 2016 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(s) are required for this contract: B

7. **SUBCONTRACTING PARTICIPATION PERCENTAGES:** 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	**3.1%**
2.	ELBE participation	**8.1%**
3.	Total mandatory participation	**11.2%**

7.1. The Bid may be declared non-responsive if the Bidder fails the following mandatory conditions:

7.1.1. Bidder's inclusion of SLBE-ELBE certified subcontractors at the overall mandatory participation percentage identified in this document; **OR**

7.1.2. Bidder's submission of 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: **March 17, 2016**
Time: **10:00 A.M.**
Location: **1010 Second Avenue, Suite 1400, 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: **March 17, 2016**
Date: **1:00 P.M.**
Location: **3902 Ninth Ave., 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.

11. SUBMISSION OF QUESTIONS:

11.1. The Director (or designee), of the Public Works Department is the officer 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. All questions related to this solicitation shall be submitted to:

Public Works Contracts
1010 Second Avenue, 14th Floor
San Diego, California, 92101
Attention: Lisa Nguyen

OR:

EMAIL: LTNguyen@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.

1.3. Due to the City's fiduciary requirement to safeguard vendor data, 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, EOCP 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 in 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 2-1.1.2, "Joint Venture Contractors" in The WHITEBOOK for details.

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")	2012	PITS070112-01
City of San Diego Standard Specifications for Public Works Construction ("The WHITEBOOK")*	2012	PITS070112-02
City of San Diego Standard Drawings*	2012	PITS070112-03
Caltrans Standard Specifications	2010	PITS070112-04
Caltrans Standard Plans	2010	PITS070112-05
California MUTCD	2012	PITS070112-06
City Standard Drawings - Updates Approved For Use (when specified)*	Varies	Varies
Standard Federal Equal Employment Opportunity Construction Contract Specifications and the Equal Opportunity Clause Dated 09-11-84	1984	769023
NOTE: *Available online under Engineering Documents and References at: http://www.sandiego.gov/publicworks/edocref/index.shtml		

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 addendum 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 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)** 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 PROCESS:

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 ACCCEPTED: 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):

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 Pledge of Compliance.

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:

Erickson-Hall Construction Co., a corporation, as principal, and Travelers Casualty and Surety Company of America, 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 SIX MILLION ONE HUNDRED AND FORTY EIGHT THOUSAND DOLLARS AND ZERO CENTS ($6,148,000.00) for the faithful performance of the annexed contract, and in the sum of SIX MILLION ONE HUNDRED AND FORTY EIGHT THOUSAND DOLLARS AND ZERO CENTS ($6,148,000.00) 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.

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

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

Dated April 27, 2016

Approved as to Form

Jan I. Goldsmith, City Attorney

By Christina Lai
Deputy City Attorney 6/6/16

Approved:

By
Albert P. Rechany
Deputy Director
Public Works Contracts

Erickson-Hall Construction Co.
Principal

By
Michael Hall
Chief Operating Officer
Erickson-Hall Construction Co.
Printed Name of Person Signing for Principal

Travelers Casualty and Surety Company of America
Surety

By
Maria Guise, Attorney-in-fact

21688 Gateway Center Drive
Local Address of Surety

Diamond Bar, CA 91765
~~Local Address (City, State) of Surety~~

(909) 612-3675
Local Telephone No. of Surety

Premium $47,140.00

Bond No. 106480655
Premium is for contract term and subject to adjustment based on final contract price.

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT **CIVIL CODE § 1189**

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 Orange)

On APR 26 2016 before me, Rhonda C. Abel, Notary Public,
Date *Here Insert Name and Title of the Officer*

personally appeared Maria Guise
Name(s) of Signer(s)

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.

RHONDA C. ABEL
COMM. # 2051838
NOTARY PUBLIC - CALIFORNIA
ORANGE COUNTY
COMM. EXPIRES DEC. 14, 2017

Signature _____
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: _____ Document Date: _____

Number of Pages: _____ Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____	Signer's Name: _____
☐ Corporate Officer — Title(s): _____	☐ Corporate Officer — Title(s): _____
☐ Partner — ☐ Limited ☐ General	☐ Partner — ☐ Limited ☐ General
☐ Individual ☒ Attorney in Fact	☐ Individual ☐ Attorney in Fact
☐ Trustee ☐ Guardian or Conservator	☐ Trustee ☐ Guardian or Conservator
☐ Other: _____	☐ Other: _____
Signer Is Representing: _____	Signer Is Representing: _____

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

TRAVELERS

POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 230312 **Certificate No.** 006578193

KNOW ALL MEN BY THESE PRESENTS: That Farmington Casualty Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company are corporations duly organized under the laws of the State of Connecticut, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc., is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

Jeri Apodaca, Rhonda C. Abel, Kim Luu, Mike Parizino, Rachelle Rheault, James A. Schaller, Heather Saltarelli, and Maria Guise

of the City of Newport Beach, State of California, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 29th day of December, 2015.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

State of Connecticut
City of Hartford ss.

By: _____
Robert L. Raney, Senior Vice President

On this the 29th day of December, 2015, before me personally appeared Robert L. Raney, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2016.

MARIE C. TETREAULT NOTARY PUBLIC CONNECTICUT

Marie C. Tetreault
Marie C. Tetreault, Notary Public

58440-8-12 Printed in U.S.A.

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, Kevin E. Hughes, the undersigned, Assistant Secretary, of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this _____ day of APR 26 2016, 20 ___.

Kevin E. Hughes, Assistant Secretary

To verify the authenticity of this Power of Attorney, call 1-800-421-3880 or contact us at www.travelersbond.com. Please refer to the Attorney-In-Fact number, the above-named individuals and the details of the bond to which the power is attached.

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

ATTACHMENTS

ATTACHMENT A

SCOPE OF WORK

SCOPE OF WORK

1. **SCOPE OF WORK:** The Scope of Work includes demolition of the existing Fire Station located at 3902 Ninth Ave, San Diego, CA, 92103 and the construction of a (10,597 SF) new station at the same site location. The scope also, includes assembling temporary station components (located at 4311 Third Avenue, San Diego 92103), which consist of a sprung structure to accommodate the fire crew until the construction of the new station is completed. Once the new station is completed, the temporary station is to be disassembled and the sprung structure is to be moved to a storage within a 30 mile radius from the temp station site location which will be provided by Fire Department at a later time. The temporary site needs to be restored to its original condition upon completion of the permanent station. Also, part of the scope is to repave the alley adjacent to the permanent station to accommodate the fire truck loads.

   1.1. The Work shall be performed in accordance with:

      1.1.1. The Notice Inviting Bids and Plans numbered **36907-01-D** through **36907-144-D** and **39207-1-D** through **39207-10-D**, inclusive.

2. **LOCATION OF WORK: The location of the Work is as follows:**

   Permanent Station: 3902 Ninth Ave., San Diego, CA 92103
   Temporary Station: 4311 Third Avenue, San Diego, CA 92103

3. **CONTRACT TIME:** The Contract Time for completion of the Work, including the Plant Establishment Period, shall be **484 Working Days.**

ATTACHMENT B

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ATTACHMENT C

EQUAL OPPORTUNITY CONTRACTING PROGRAM

EQUAL OPPORTUNITY CONTRACTING PROGRAM REQUIREMENTS

1. To The WHITEBOOK, Chapter 10, Sections D and E, DELETE each in its entirety, and SUBSTITUTE with the following:

D. CITY'S EQUAL OPPORTUNITY COMMITMENT.

1. Nondiscrimination in Contracting Ordinance.

1. The Contractor, Subcontractors and Suppliers shall comply with requirements of the City's Nondiscrimination in Contracting Ordinance, San Diego Municipal Code §§22.3501 through 22.3517.

   The Contractor shall not discriminate on the basis of race, gender, religion, national origin, ethnicity, sexual orientation, age, or disability in the solicitation, selection, hiring, or treatment of subcontractors, vendors, or suppliers. The Contractor shall provide equal opportunity for subcontractors to participate in subcontracting opportunities. The Contractor understands and agrees that violation of this clause shall be considered a material breach of the contract and may result in contract termination, debarment, or other sanctions.

   The Contractor shall include the foregoing clause in all contracts between the Contractor and Subcontractors and Suppliers.

2. Disclosure of Discrimination Complaints. As part of its Bid or Proposal, 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 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.

3. Upon the City's request, the Contractor agrees to provide to the City, within 60 days, a truthful and complete list of the names of all Subcontractors and Suppliers that the Contractor has used in the past 5 years on any of its contracts that were undertaken within San Diego County, including the total dollar amount paid by the Contractor for each subcontract or supply contract.

4. The Contractor further agrees to fully cooperate in any investigation conducted by the City pursuant to the City's Nondiscrimination in Contracting Ordinance, Municipal Code §§22.3501 through 22.3517. The Contractor understands and agrees that violation of this clause shall be considered a material breach of the Contract and may result in remedies being ordered against the Contractor up to and including contract termination, debarment and other sanctions for violation of the provisions of the Nondiscrimination in Contracting Ordinance. The Contractor further understands and agrees that the procedures, remedies and sanctions provided for in the Nondiscrimination in Contracting Ordinance apply only to violations of the Ordinance.

E. EQUAL EMPLOYMENT OPPORTUNITY OUTREACH PROGRAM.

1. The Contractor, Subcontractors and Suppliers shall comply with the City's Equal Employment Opportunity Outreach Program, San Diego Municipal Code §§22.2701 through 22.2707.

   The Contractor shall not discriminate against any employee or applicant for employment on any basis prohibited by law. Contractor shall provide equal opportunity in all employment practices. Prime Contractor shall ensure their subcontractors comply with this program. Nothing in this section shall be interpreted to hold a prime contractor liable for any discriminatory practice of its subcontractors.

   The Contractor shall include the foregoing clause in all contracts between the Contractor and Subcontractors and Suppliers.

2. If the Contract is competitively solicited, the selected Bidder shall submit a Work Force Report (Form BB05), within 10 Working Days after receipt by the Bidder of Contract forms to the City for approval as specified in the Notice of Intent to Award letter from the City.

3. If a Work Force Report is submitted, and the City determines there are under-representations when compared to County Labor Force Availability data, the selected Bidder shall submit an Equal Employment Opportunity Plan.

4. If the selected Bidder submits an Equal Employment Opportunity Plan, it shall include the following assurances:

   1. The Contractor shall maintain a working environment free of discrimination, harassment, intimidation and coercion at all sites and in all facilities at which the Contractor's employees are assigned to work.

   2. The Contractor reviews its EEO Policy, at least annually, with all on-site supervisors involved in employment decisions.

   3. The Contractor disseminates and reviews its EEO Policy with all employees at least once a year, posts the policy statement and EEO posters on all company bulletin boards and job sites, and documents every dissemination, review and posting with a written record to identify the time, place, employees present, subject matter, and disposition of meetings.

   4. The Contractor reviews, at least annually, all supervisors' adherence to and performance under the EEO Policy and maintains written documentation of these reviews.

   5. The Contractor discusses its EEO Policy Statement with subcontractors with whom it anticipates doing business, includes the EEO Policy Statement in its subcontracts, and provides such documentation to the City upon request.

6. The Contractor documents and maintains a record of all bid solicitations and outreach efforts to and from subcontractors, contractor associations and other business associations.

7. The Contractor disseminates its EEO Policy externally through various media, including the media of people of color and women, in advertisements to recruit, maintains files documenting these efforts, and provides copies of these advertisements to the City upon request.

8. The Contractor disseminates its EEO Policy to union and community organizations.

9. The Contractor provides immediate written notification to the City when any union referral process has impeded the Contractor's efforts to maintain its EEO Policy.

10. The Contractor maintains a current list of recruitment sources, including those outreaching to people of color and women, and provides written notification of employment opportunities to these recruitment sources with a record of the organizations' responses.

11. The Contractor maintains a current file of names, addresses and phone numbers of each walk-in applicant, including people of color and women, and referrals from unions, recruitment sources, or community organizations with a description of the employment action taken.

12. The Contractor encourages all present employees, including people of color and women employees, to recruit others.

13. The Contractor maintains all employment selection process information with records of all tests and other selection criteria.

14. The Contractor develops and maintains documentation for on-the-job training opportunities, participates in training programs, or both for all of its employees, including people of color and women, and establishes apprenticeship, trainee, and upgrade programs relevant to the Contractor's employment needs.

15. The Contractor conducts, at least annually, an inventory and evaluation of all employees for promotional opportunities and encourages all employees to seek and prepare appropriately for such opportunities.

16. The Contractor ensures the company's working environment and activities are non-segregated except for providing separate or single-user toilets and necessary changing facilities to assure privacy between the sexes.

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 sections1810 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) Standard Specifications for Public Works Construction (The GREENBOOK) currently in effect.

2) The City of San Diego Standard Specifications for Public Works Construction (The WHITEBOOK).

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

1-2 TERMS AND DEFINITIONS.

Normal Working Hours. To the City Supplement, ADD the following:

The Normal Working Hours are **7:00 AM** to **3:30 PM.**

SECTION 2 - SCOPE AND CONTROL OF WORK

2-3.2 Self Performance. DELETE in its entirety and SUBSTITUTE with the following:

1. The self-performance percentage requirement will be waived for contracts when a "B" License is required or allowed.

2-5.3.1 General. To the City Supplement, ADD the following

7. For products for which an AML is available, products listed in the AML shall be used. A submittal review will be conducted for products not identified on an AML on a case-by-case basis when:

   a) The product type or category is not in the AML.

   b) The AML does not list at least two available manufacturers of the product.

   c) The material or manufacturer listed in the AML is no longer available. Documentation to substantiate the product is no longer available or in production is required as part of the submittal.

   In the case of conducting a submittal review when required by the Plans or Special Provisions, or when requested by the Engineer, all submittals shall be accompanied by the City's submittal form.

The Product Submittal Form is available for download at:

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

2-7 **SUBSURFACE DATA.** ADD the following:

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

    1. Three reports of Geotechnical Evaluation for the Permanent Fire Station, dated March 2, 2012, and temporary fire station, dated February 11, 2016, and alley pavement, Geotechnical dated May 28, 2013 all performed by Ninyo & Moore and Associates.

5. The reports listed above are available for review by contacting the Contract Specialist or by referring to Appendix D.

2-9.1 **Permanent Survey Markers.** To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

1. Pursuant to Division 3, Chapter 15 of the Business and Professions Code, you shall not disturb survey monuments that "control the location of subdivisions, tracts, boundaries, roads, streets, or highways, or provide horizontal or vertical survey control" until they have been tied out by a Registered Land Surveyor or Registered Civil Engineer authorized to practice land surveying within the State of California.
2. Monument Preservation shall be performed by the City's Construction Management and Field Services (CMFS) Division on all Projects, unless permission is obtained for these services in writing by CMFS.
3. You shall submit to the Engineer a minimum of 7 Days prior to the start of the Work a list of controlling survey monuments which may be disturbed. CMFS shall do the following:
    a) Set survey points outside the affected Work area that reference and locate each controlling survey monument that may be disturbed.
    b) File a Corner Record or Record of Survey with the County Surveyor after setting the survey points to be used for re-establishment of the disturbed controlling survey monuments.
    c) File a Corner Record of Record of Survey with the County Surveyor after re-establishment of the disturbed controlling survey monuments.

2-9.2 **Survey Service.** DELETE in its entirety and SUBSTITUTE with the following:

1. Prior to the start of construction, you shall submit a letter to the Engineer identifying the Licensed Land Surveyor or the Registered Civil Engineer authorized to practice land surveying within the State of California that will be performing the survey services for the Project.

2. You are responsible for performing and meeting the accuracy of surveying standards adequate for construction through a Licensed Land Surveyor or a Registered Civil Engineer authorized to practice land surveying within the State of California.

3. Survey stakes shall be set and stationed by you for curbs, headers, water mains, sewers, storm drains, structures, rough grade, and any other structures and appurtenances that are needed for the Project. A corresponding cut or fill to finished grade (or flow line) shall be indicated on a grade sheet.

4. Surveys performed shall list the basis of bearings as tied to Record of Survey 14492 or equivalent, based on the California Coordinate System of 1983, Zone 6, U.S. Survey foot, epoch 1991.35, along with a completed calibration sheet (blank form will be supplied by City Surveys). The vertical datum used shall be NGVD 29 in accordance with the City of San Diego Vertical Bench Book.

5. You shall preserve construction survey stakes, control points, and other survey related marks for the duration of the Project. If any construction survey stakes are lost or disturbed and need to be replaced, such replacement shall be performed by the Engineer at your expense.

2-9.2.1 Survey Files.

1. All Computer Aided Drafting (CAD) Work shall be done in accordance with the City of San Diego's Citywide Computer Aided Design and Drafting (CADD) Standards and shall be in City seed files (.job, .txt, .dgn, .alg, .raw, .fwd, .dtm, .pdf, .docx, .xlsx, .tif, and .jpg).

2. All survey files shall be completed in accordance with the City of San Diego's Citywide CADD Standards and shall adhere to the City's Microstation level and attribute structure.

3. The survey file deliverable will be either one Master .dgn file containing all xref's in geospatially referenced (and attached) models or one Master dgn with all xref's geospatially referenced (and attached) as dgn files. Resource files may be sent to you if requested.

4. Survey files shall include, but shall not be limited to, the following items:

   a. Street center line and (record width) right-of-way lines.

   b. Project geometry (.alg) files (this will be generated for use in InRoads).

   c. 3D surface model (.dtm, break line and spot elevation) file.

   d. Spot elevations of the new utility main at each intersection, midblocks, and for any change in grade.

   e. Monuments.

   f. Curb lines (top curb and gutter).

   g. All other appurtenances including but not limited to water valves, meters, vaults, manholes, fire hydrants, utility boxes, cleanouts, and poles.

5. You shall use the survey information to produce red-lines drawings as described in Section 2-5.4 "Red-lines and Record Documents."

2-9.2.2 **Submittal.**

1. Survey files shall be submitted in accordance with 2-5.3, "Submittals" and 2-5.4, "Red-Lines and Record Documents". You shall provide the Survey Files, proposed Drawings, and/or Red-line Drawings on a CD/DVD to the Engineer and shall post the Survey Files, proposed Drawings, and/or Red-line Drawings to the following website:

   ftp://ftp.sannet.gov/IN/SURVEYS/

2. After the documents have been posted to the website, you shall send a confirmation email, which includes the hyperlink to the website, to the Engineer and to SurveyReview@sandiego.gov

3. All survey Work and submittals which reveal non-compliance with the requirements of the Construction Documents shall be corrected as deemed necessary by the Engineer and the cost of the corrections to your survey submittals shall be at your expense.

2-9.2.3 **Payment.**

1. The payment for survey services Work shall be included in the lump sum Bid item for the construction of Fire Station No. 5.

2-14.3 **Coordination.** To the City Supplement, ADD the following:

Other adjacent City project is scheduled for construction for the same time period in the vicinity. See **Appendix "I"** for approximate location. Coordinate the Work with the adjacent project as listed below:

a) University Avenue Pipeline Replacement/Main Transmission. Project Manager Mike Bajoua 619/533-4628.

SECTION 4 - CONTROL OF MATERIALS

4-1.3.4 **Inspection Paid For By the Contractor.** To the City Supplement, ADD the following:

Special inspection as indicated on Sheet S-D.3 of these contract plans.

4-1.3.6 **Preapproved Materials.** To the City Supplement, 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.** ADD the following:

You must submit your list of proposed substitutions for "an equal" ("or equal") item(s) **no less than 5 Working Days after the determination of the Apparent Low Bidder** and on the City's Product Submittal Form available at:

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

4-1.10 **Foreign Materials.** To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

1. Materials that are manufactured, produced, or fabricated outside of the United States shall be delivered to a distribution point in California, unless otherwise specified. Quality Control and related testing shall be performed to all applicable specified US standards. Manufacturer's testing and staff certification shall be traceable to a United States regulatory agency. Retain the materials for a sufficient period of time to permit inspection, sampling, and testing. You shall not be entitled to an extension of time for acts or events occurring outside of, at point of entry, or during transport to the United States.

SECTION 5 – UTILITIES

5-2 **PROTECTION.** ADD the following:

1. You shall repair or replace traffic signal and lighting system equipment within 72 hours after notification of defects by the Engineer.
2. While working in or around meter boxes, you shall protect in place all Advanced Metering Infrastructure (AMI) devices attached to the water meter or located in or near water meter boxes, coffins, or vaults. This includes any antenna installed through the meter box lid.
   a) Avoid damaging the antenna, cable, and endpoints when removing the meter box lid and when disconnecting AMI endpoints from the register on top of the water meter.
   b) If meters or AMI devices need to be removed or relocated, the AMI endpoints shall be reinstalled with the Encoder/Receiver/Transmitter (ERT) pointing upwards.
   c) Because the AMI equipment is uniquely matched to each service location and to specific meter serial numbers, any AMI devices that are removed or disconnected shall be reinstalled on the same service lateral as well as to the same meter serial number it was attached to originally.
   d) Do not change or modify the lid if the lid has an antenna drilled through it.
   e) If you encounter damaged, disconnected, buried, or broken AMI endpoints, cables between the registers, antennae, lids, or ERTs, notify the Engineer within 24 hours.
   f) Any AMI equipment damaged by you shall be repaired or replaced by City Forces at your expense.

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

6-1.1 **Construction Schedule.** To item 20, ADD the following:

The **120 Calendar Days** for the Plant Establishment Period is included in the stipulated Contract Time.

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

7-3 LIABILITY INSURANCE. DELETE in its entirety and SUBSTITUTE with the following:

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

7-3.1 Policies and Procedures.

1. You must 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 must 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. Payment for insurance is included in the various items of Work as bid by you, and 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 must 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 must 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 must 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 must be no endorsement or modification limiting the scope of coverage for either "insured vs. insured" claims or contractual liability. You must maintain the same or equivalent insurance for at least 10 years following completion of the Work.

4. All costs of defense must be outside the policy limits. Policy coverage must be in liability limits of not less than the following:

General Annual Aggregate Limit	Limits of Liability
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 must 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 must be outside the limits of the policy.

7-3.2.5 Contractors Builders Risk Property Insurance..

1. You must provide at its expense, and maintain until Final Acceptance of the Work, a Special Form Builders Risk Policy or Policies. This insurance must 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 must be 100% of this contract value of the Work plus15% to cover administrative costs, design costs, and the costs of inspections and construction management.

2. Insured property must include material or portions of the Work located away from the Site but intended for use at the Site, and must cover material or portions of the Work in transit. The policy or policies must include as insured property scaffolding, falsework, and temporary buildings located at the Site. The policy or policies must cover the cost of removing debris, including demolition.

3. The policy or policies must provide that all proceeds thereunder must be payable to the City as Trustee for the insured, and must name the City, the Contractor, Subcontractors, and Suppliers of all tiers as named insured. We 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 must 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 must 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 must 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 must be entitled to 100% of its loss. The Contractor must 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 must be responsible for 100% of the loss not insured because of the deductible. Except as provided for under California law, the policy or policies must 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 must 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 must 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 must 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.**

a) You must 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.

b) To the fullest extent allowed by law e.g., California Insurance Code §11580.04, the policy must be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured.

c) The additional insured coverage for projects for which the Engineer's Estimate is $1,000,000 or more must 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.

d) The additional insured coverage for projects for which the Engineer's Estimate is less than $1,000,000 must 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 must 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 must provide that any insurance maintained by the City and its elected officials, officers, employees, agents and representatives must be in excess of your insurance and must not contribute to it.

7-3.5.1.3 **Project General Aggregate Limit.** The policy or policies must 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 must reduce the Designated Construction Project General Aggregate Limit. The Designated Construction Project General Aggregate Limit must 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 must 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.

7-3.5.5 **Builders Risk Endorsements.**

7-3.5.5.1 **Waiver of Subrogation.** The policy or policies must 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 desire 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 must immediately notify your Builder's Risk insurer and obtain an endorsement that the policy or policies must not be cancelled or lapse on account of any such partial use or occupancy. You must obtain the endorsement prior to our occupation and use.

7-3.6 **Deductibles and Self-Insured Retentions.** You must pay for all deductibles and self-insured retentions. You must 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 must 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 must follow the form of the primary policy or policies e.g., all endorsements.

7-3.10 **Architects and Engineers Professional Insurance (Errors and Omissions Insurance).**

1. For Contracts with required engineering services (e.g., Design-Build, preparation of engineered Traffic Control Plans (TCP), and etc) by you, you shall keep or require all of your employees or Subcontractors, who provide professional engineering services under this contract, Professional Liability coverage with a limit of **$1,000,000** per claim and **$2,000,000** annual aggregate in full force and effect.

2. You shall ensure the following:

   a) The policy retroactive date is on or before the date of commencement of the Project.

   b) The policy will be maintained in force for a period of 3 years after completion of the Project or termination of this Contract, whichever occurs last. You agree that for the time period specified above, there will be no changes or endorsements to the policy that affect the specified coverage.

3. If professional engineering services are to be provided solely by the Subcontractor, you shall:

   a) Certify this to the City in writing and

   b) Agree in writing to require the Subcontractor to procure Professional Liability coverage in accordance with the requirements set forth above.

7-4 **WORKERS' COMPENSATION INSURANCE.** DELETE in its entirety and SUBSTITUTE with the following:

7-4.1 Workers' Compensation Insurance and Employers Liability Insurance.

1. In accordance with the provisions of §3700 of the California Labor Code, you must 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 must be not less than the following:

Workers' Compensation	Statutory Employers Liability
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 require every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code and you must comply with such provisions before commencing the Work as required by §1861 of the California Labor Code.

7-4.1.1 Waiver of Subrogation. The policy or policies must 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. ADD the following:

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

7-15 INDEMNIFICATION AND HOLD HARMLESS AGREEMENT. To the City Supplement, fourth paragraph, last sentence, DELETE in its entirety and SUBSTITUTE with the following:

Your duty to indemnify and hold harmless does not include any claims or liability arising from the established active or sole negligence, or willful misconduct of the City, its officers, or employees.

7-16 COMMUNITY LIAISON. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

ADD:

7-16 COMMUNITY OUTREACH.

7-16.1 General.

1. To ensure consistency with the City's community outreach plan for the project, the City shall work with you to inform the public (which includes, but shall not be limited to, property owners, renters, homeowners, business owners, recreational users, and other community members and stakeholders) of construction impacts. Your efforts to mitigate construction impacts by communicating with the public require close coordination and cooperation with the City.

2. You shall perform the community outreach activities required throughout the Contract Time. You shall assign a staff member who shall perform the required community outreach services.

3. You shall closely coordinate the Work with the businesses, institutions, residents, and property owners impacted by the Project.

4. Your example duties include notifying businesses, institutions, and residents of the commencement of construction activities not less than 5 Days in advance, coordinating access for vehicular and pedestrian traffic to businesses, institutions, and residences impacted by the Project, reporting activities at all Project progress meetings scheduled by the Engineer, attending the Project Pre-construction meeting, attending 2 community meetings, responding to community questions and complaints related to your activities, and documenting, in writing, as well as logging in all inquiries and complaints received into the City's internal public contact tracking system.

5. You shall execute the Information Security Policy (ISP) Acknowledgement Form - For Non-City Employees within 15 Days of the award of the Contract if any of the following apply:

   a) Your contact information is made available on any outreach materials.

   b) You will be the primary point of contact to resolve project related inquiries and complaints.

6. Electronic Communication.

   a) All inquiries and complaints shall be logged in to the City's internal public contact tracking system within 24 hours of receipt of inquiries and complaints.

   b) Any updates or a resolution of inquiries and complaints shall be documented in the City's internal public contact tracking system within 24 hours.

   c) Copies of email communications shall be saved individually on to the City's internal public contact tracking system in an Outlook Message Format (*.msg).

   d) All graphics, photos, and other electronic files associated with inquiries and/or complaints shall be saved into the individual records, located within the City's internal public contact tracking system.

7-16.1.1 Quality Assurance.

1. During the course of community outreach, you shall ensure that the character of all persons that conduct community outreach (distributing door hangers, attending community meetings, interacting with the public, and etc.) on your behalf shall:

   a. Have the ability to speak and comprehend English and/or Spanish, as appropriate for the community or public they are informing.

   b. Possess and display easily verifiable and readable personal identification that identifies the person as your employee.

   c. Have the interpersonal skills to effectively, professionally, and tactfully represent you, the project, and the City to the public.

7-16.1.2 Submittals.

1. You shall submit to the Resident Engineer, for review and approval, all drafts of letters, notices, postcards, door hangers, signs, mailing lists, proposed addresses for hand-delivery, and any other notices and letters that are to be mailed and or distributed to the public.

    a. Prior to distributing or mailing, you shall submit final drafts of letters, notices, postcards, door hangers, signs, and any other notices and letters to the Resident Engineer for final review and approval. Submit a PDF copy of the approved door hangers to the Engineer.

    b. After distributing or mailing, you shall submit verification of delivery and any copies of returned notices to the Resident Engineer. Submit a PDF copy of the approved letters and notices to the Engineer.

2. You shall use the City's internal public contact tracking system to identify and summarize communications (via phone, in person, and email) with the public within 24 hours of receipt, even if your response to the individual is still incomplete. You shall upload to the City's internal public contact tracking system copies of all written, electronic, and verbal communications and conversations with the public.

7-16.2 Community Outreach Services.

7-16.2.1 Public Notice by Contractor.

1. Post Project Identification Signs in accordance with 7-10.6.2, "Project Identification Sign".

2. Notify businesses, institutions, property owners, residents or any other impacted stakeholders, within a minimum 300 feet (90 m) radius of the Project, of construction activities and utility service interruptions not less than 5 Days in advance.

3. Furnish and distribute public notices in the form of door hangers using the City's format to all occupants and/or property owners along streets:

    a. Where Work is to be performed at least 5 Days before starting construction or survey activities or impacting the community as approved by the Resident Engineer.

    b. Within 5 Days of the completion of your construction activities where Work was performed, you shall distribute public notices in the form of door hangers, which outlines the anticipated dates of Asphalt Resurfacing or Slurry Seal.

    c. No less than 48 hours in advance and no more than 72 hours in advance of the scheduled resurfacing.

4. Leave the door hanger notices on or at the front door of each dwelling and apartment unit and at each tenant of commercial buildings abutting each of the street block segments. Where the front doors of apartment units are inaccessible, distribute the door hanger notices to the apartment manager or security officer.

5. Door Hanger Material: You shall use Blanks/USA brand, Item Number DHJ5B6WH, 1¼ inch (31.8 mm) Holes (removed), 2-up Jumbo Door Hanger in Bristol White, or approved equal.

6. Mailed Notice Material: You shall use Cougar by Domtar, Item Number 2834, or approved equal.

7. For all Work on private property, contact each owner and occupant individually a minimum of 15 Days prior to the Work. If the Work has been delayed, re-notify owners and occupants of the new Work schedule, as directed by the Resident Engineer.

8. A sample of public notices is included in the Contract Appendix.

7-16.2.2 Communications with the Public.

1. Coordinate access for vehicular and pedestrian traffic to businesses, institutions, and residences impacted by the Project.

2. You shall provide updates on construction impacts to the Resident Engineer. You shall notify the Resident Engineer in advance about time-sensitive construction impacts and may be required to distribute construction impact notices to the public on short notice.

3. You shall incorporate community outreach activities related to construction impacts in the baseline schedule and update the Resident Engineer with each week's submittal of the Three-Week Look Ahead Schedule.

4. At the request of the Resident Engineer, you shall attend and participate in project briefings at community meetings.

5. You shall coordinate with the Resident Engineer on all responses and actions taken to address public inquiries and complaints within the 24 hours that they are received.

7-16.2.3 Communications with Media.

1. The City may allow members of the media access to its construction site(s) on a case-by-case basis only.

2. Occasionally, uninvited members of the media may show up at construction Sites. Members of the media (including, but not limited to newspapers, magazines, radios, television, bloggers, and videographers) do not have the legal right to be in the construction Site without the City's permission.

3. In the event that media representatives arrive near or on the construction Site(s), you shall keep them off the Site(s) in a courteous and professional manner until a Public Information Officer is available to meet them at an approved location.

4. You shall report all visits from members of the media to the Resident Engineer as quickly as possible so that the City's Public Information Officer can meet with the members of the media at the construction Site(s).

5. If the City allows members of the media to access a construction Site, you shall allow the City to escort the media representatives while they are on the construction Site and shall ensure their safety.

6. You shall require media representatives to sign in and out of the Site Visitor Log and to use personal protective equipment.

7. You have a right to speak to members of the media about your company and its role on the project. All other questions shall be referred to the City.

7-16.4 Payment.

1. The payment for the community outreach services shall be included in the Contract Price.

7-20 ELECTRONIC COMMUNICATION. ADD the following:

1. Virtual Project Manager will be used on this contract.

SECTION 9 - MEASUREMENT AND PAYMENT

9-3.2.5 Withholding of Payment. To the City Supplement, item i), DELETE in its entirety and SUBSTITUTE with the following:

i) Your failure to comply with 7-2.3, "PAYROLL RECORDS" and 2-16, "CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM."

ADD:

9-3.7 Compensation Adjustments for Price Index Fluctuations. To the City Supplement, subsection c), item 2, DELETE in its entirety and SUBSTITUTE with the following:

2) In the event of an overrun of Contract time, adjustment in compensation for asphalt binder included in estimates during the overrun period shall be determined using the California Statewide Crude Oil Price Index in effect on the first business day of the month within the pay period in which the overrun began.

ADD the following:

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

SECTION 300 – EARTHWORK

300-1.4 Payment. To the City Supplement, paragraph (2), DELETE in its entirety and SUBSTITUTE with the following:

2. Payment for existing pavement removal and disposal of up to 12" thick, within the excavation e.g., trench limits, shall be included in the Bid item for installation of the mains or the Work item that requires pavement removal.

SECTION 302 – ROADWAY SURFACING

302-3 PREPARATORY REPAIR WORK. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

302-3 PREPARATORY REPAIR WORK.

1. Prior to roadway resurfacing or the application of slurry, the Contractor shall complete all necessary preparation and repair work to the road segment e.g., tree trimming, weed spray, weed abatement, crack sealing, asphalt repair, hump removal, miscellaneous asphalt patching, removal of raised pavement markers, removal of pavement markings, etc. and as specified in the Special Provisions.

2. Preparatory work shall include, but not be limited to, tree trimming, weed spray, weed abatement, crack sealing, asphalt repair i.e., mill and pave, hump removal, miscellaneous asphalt patching, removal of raised pavement markers, removal of pavement markings, etc.

3. The Contractor shall repair areas of distressed asphalt concrete pavement by milling or removing damaged areas of pavement to a minimum depth of 2" for Residential streets, and a minimum depth of 3" for all others to expose firm and unyielding pavement. The Contractor shall prepare subgrade as needed and install a minimum of 2" for residential streets, and a minimum of 3" for all others, of compacted asphalt concrete pavement over compacted native material as directed by the Engineer.

4. If, in order to achieve the minimum specified depth, the base material is exposed, the material shall be compacted to 95% relative compaction to a depth 10" below the finished grade (dig out). Compaction tests shall be made to ensure compliance with the specifications. The Engineer will determine when and where the test will occur. The City will pay for the soils testing required by the Engineer, which meets the required compaction. The Contractor shall reimburse the City for the cost of retesting failing compaction tests. If additional base material is required, the Contractor shall use Class 2 Aggregate Base in accordance with 200-2.2, "Crushed Aggregate Base."

5. Recycled base material shall conform to Crushed Miscellaneous Base Material in accordance with 200-2.4, "Crushed Miscellaneous Aggregate Base."

6. Prior to replacing asphalt, the area shall be cleaned by removing all loose and damaged material, moisture, dirt, and other foreign matter and shall be tack coated in accordance with 302-5.4 "Tack Coat."

7. The Contractor shall install new asphalt within the repair area or for patches in accordance with 302-5, "ASPHALT CONCRETE PAVEMENT." Asphalt concrete shall be C2-PG 64-10 in compliance with 400-4, "ASPHALT CONCRETE."

8. No preparatory asphalt work shall be done when the atmospheric temperature is below 50 °F or during unsuitable weather.

9. Following the asphalt placement, the Contractor shall roll the entire area of new asphalt in both directions at least twice. The finished patch shall be level and smooth in compliance with 302-5.6.2 "Density and Smoothness." After placement and compaction of the asphalt patch, the Contractor shall seal all finished edges with a 4" wide continuous band of SS-1H.

10. The minimum dimension for each individual repair shall be 4' x 4' and shall be subject to the following conditions:

a) If the base material is exposed to achieve the required minimum removal thickness, the base material shall be prepared conforming to 301-1, "SUBGRADE PREPARATION."

b) When additional base material is required, then the contractor shall use Class 2 Aggregate Base in accordance with 200-2.2, "Crushed Aggregate Base." Recycled base material shall conform to Crushed Miscellaneous Base Material in accordance with 200-2.4, "Crushed Miscellaneous Base."

c) The Contractor may use grinding as a method for removal of deteriorated pavement when the areas indicated for removal are large enough (a minimum of the machine drum width) and when approved by the Engineer.

d) For both scheduled and unscheduled base repairs, failed areas may be removed by milling or by excavation provided that the edges are cut cleanly with a saw. The areas shall be cleaned and tack coated in accordance with 302-5.4, "Tack Coat" before replacing the asphalt. The areas for scheduled repairs have been marked on the street.

302-3.1 Asphalt Patching.

1. Asphalt patching shall consist of patching potholes, gutter-line erosion, and other low spots in the pavement that are deeper than ½" per 302-5.6.2, "Density and Smoothness." These areas are generally smaller and more isolated than those areas in need of mill and pave.

2. The areas requiring patching have been identified in the Contract Documents, marked on the streets, or as directed by the Engineer. The Contractor shall identify any new areas that may require patching prior to slurry work to ensure the smoothness and quality of the finished product.

3. The Contractor shall identify and repair any areas that may require patching, prior to the placement of slurry seal for smooth finished product.

4. Asphalt overlay shall not be applied over deteriorated pavement. Preparatory asphalt work shall be completed and approved by the Engineer before proceeding with asphalt overlay.

5. The Contractor shall remove distressed asphalt pavement either by saw cutting or milling, to expose firm and unyielding pavement; prepare subgrade (as needed); and install compacted asphalt concrete pavement over compacted native material as directed by the Engineer.

6. Prior to replacing asphalt, the area shall be cleaned and tack coated per 302-5.4, "Tack Coat".

7. Following the asphalt placement, the Contractor shall roll the entire patch in both directions covering the patch at least twice.

8. After placement and compaction of the asphalt patch, the Contractor shall seal all finished edges with a 4" wide continuous band of SS-1H.

9. Base repairs shall not exceed 20% RAP in content.

302-3.2 Payment.

1. Payment for replacement of existing pavement when required shall be included in the unit bid price for Asphalt Pavement repair for the total area replaced and no additional payment shall be made regardless of the number of replacements completed. No payment shall be made for areas of over excavation or outside trench areas in utility works unless previously approved by the Engineer. No payment for pavement replacement will be made when the damage is due to the Contractor's failure to protect existing improvements. The Contractor shall reimburse the City for the cost of retesting all failing compaction tests.

2. The areas and quantities shown on the road segments and in appendices are given only for the Contractor's aid in planning the Work and preparing Bids. The Engineer will designate the limits to be removed and these designated areas shall be considered to take precedent over the area shown in an Appendix to the Contract Documents. The quantities shown in the appendices are based on a street assessment survey and may vary.

3. At the end of each day, the Contractor shall submit to the Engineer an itemized list of the asphalt pavement repair work completed. The list shall include the location of the work and the exact square footage of the repair.

4. Preparatory repair work and tack coating will be paid at the Contract unit price per ton for Asphalt Pavement Repair. No payment shall be made for areas of over excavation unless previously approved by the Engineer.

5. Milling shall be included in the Bid item for Asphalt Pavement Repair unless separate Bid item has been provided.

6. Payment for miscellaneous asphalt patching shall be included in the Contract unit price for slurry and no additional payment shall be made therefore.

302-5.1.1 Damaged AC Pavement Replacement. To the City Supplement, DELETE in its entirety.

302-5.1.2 Measurement and Payment. To the City Supplement, DELETE in its entirety.

302-5.2.1 Measurement and Payment. To the City Supplement, item c), ADD the following:

Imported Subgrade material shall be paid per bid item "Imported Backfill".

SECTION 306 – UNDERGROUND CONDUIT CONSTRUCTION

306-1 **OPEN TRENCH OPERATIONS.** To the City Supplement, CORRECT certain section numbering as follows:

OLD SECTION NUMBER	TITLE	NEW SECTION NUMBER
306-1.8	**House Connection Sewer (Laterals) and Cleanouts**	**306-1.9**
306-1.7.1	**Payment**	**306-1.9.1**
306-1.7.2	**Sewer Lateral with Private Replumbing**	**306-1.9.2**
306-1.7.2.1	**Location**	**306-1.9.2.1**
306-1.7.2.2	**Permits**	**306-1.9.2.2**
306-1.7.2.3	**Submittals**	**306-1.9.2.3**
306-1.7.2.4	**Trenchless Construction**	**306-1.9.2.4**
306-1.7.2.5	**Payment**	**306-1.9.2.5**
306-1.7.3.6	**Private Pump Installation**	**306-1.9.2.6**
306-1.7.3.7	**Payment**	**306-1.9.2.7**

306-1.6 **Basis of Payment for Open Trench Installations.** ADD the following:

Payment for imported backfill when the Contractor elects to import material from a source outside the project limits and when authorized by the Engineer shall be included in the Bid unit price for Imported Backfill. The price shall include the removal and disposal of unsuitable materials.

306-22 **PIPE FUSION.** DELETE in its entirety.

SECTION 308 – LANDSCAPE AND IRRIGATION INSTALLATION

308-7 **GUARANTEE.** To the City Supplement, DELETE in its entirety.

308-7 **PAYMENT.** ADD the following:

Work related to tree maintenance shall be included in the Bid items as follows:

- Tree Trimming (EA)
- Root Pruning (EA)
- Root Barrier (EA)

308-8 **PAYMENT.** To the City Supplement, DELETE in its entirety.

SECTION 705 – WATER DISCHARGES

705-2.6.1 **General.** Paragraph (3), CORRECT reference to Section 803 to read "Section 703."

705-2.6.3 **Community Health and Safety Plan.** To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

705-2.6.3 **Community Health and Safety Plan.** See 703-2, "Community Health and Safety Plan."

SECTION 707 – RESOURCE DISCOVERIES

ADD:

707-1.1 **Environmental Document.** The City of San Diego Environmental Analysis Section (EAS) of the Development Services Department has prepared a **Notice of Exemptions** for **Fire Station No. 5**, Project No. **208885**, as referenced in the Contract Appendix. You must comply with all requirements of the **Notice of Exemptions** as set forth in the Contract **Appendix A.**

Compliance with the City's environmental document is included in the various Bid items, unless a bid item has been provided.

END OF SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

SUPPLEMENTARY SPECIAL PROVISIONS

APPENDICES

APPENDIX A

NOTICE OF EXEMPTIONS

NOTICE OF EXEMPTION

(Check one or both)

TO: X RECORDER/COUNTY CLERK
P.O. BOX 1750, MS A-33
1600 PACIFIC HWY, ROOM 260
SAN DIEGO, CA 92101-2422

_____ OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET, ROOM 121
SACRAMENTO, CA 95814

FROM: CITY OF SAN DIEGO
DEVELOPMENT SERVICES DEPARTMENT
1222 FIRST AVENUE, MS 501
SAN DIEGO, CA 92101

PROJECT NO.: 208885 PROJECT TITLE: FIRE STATION 5

PROJECT LOCATION-SPECIFIC: The project is located at 3902 Ninth Avenue in the Uptown Community Planning Area. (Council District 3).

PROJECT LOCATION-CITY/COUNTY: San Diego/San Diego

DESCRIPTION OF NATURE AND PURPOSE OF THE PROJECT: The project would demolish an existing 4,118 square-foot fire station and replace with a new two story 10,597 square-foot fire station with various site improvements on a .31 acre site. The station will house a crew of eight and one battalion chief and accommodate one engine, one aerial truck and one battalion chief vehicle.

NAME OF PUBLIC AGENCY APPROVING PROJECT: City of San Diego

NAME OF PERSON OR AGENCY CARRYING OUT PROJECT: City of San Diego, Public Works Contact: William Meredith 600 B Street, Suite 900 (MS 908A) San Diego, CA 92101 (619) 533-5418

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)
(X) CATEGORICAL EXEMPTION: 15302(c) [REPLACEMENT OR RECONSTRUCTION]
( ) STATUTORY EXEMPTION:

REASONS WHY PROJECT IS EXEMPT: Since the proposed fire station would be located on the same site as the existing fire station and would serve the same purpose and would not substantially expand capacity, the City of San Diego has determined the project meets the categorical exemption criteria set forth in the CEQA State Guidelines, Section 15302(c) [Replacement or Reconstruction]. The exemption allows for the replacement of existing structures and facilities where the new structure will be located on the same site as the structure replaced, and will have substantially the same purpose and capacity as the structure replaced and where the exceptions listed in Section 15300.2 would not apply.

LEAD AGENCY CONTACT PERSON: Jeffrey Szymanski TELEPHONE: (619) 446-5324

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

IT IS HEREBY CERTIFIED THAT THE CITY OF SAN DIEGO HAS DETERMINED THE ABOVE ACTIVITY TO BE EXEMPT FROM CEQA

Jeffrey E. Szymanski / SENIOR PLANNER
SIGNATURE/TITLE

February 12, 2013
DATE

CHECK ONE:

(X) SIGNED BY LEAD AGENCY
( ) SIGNED BY APPLICANT

DATE RECEIVED FOR FILING WITH COUNTY CLERK OR OPR:

NOTICE OF EXEMPTION

(Check one or both)

TO: __X__ RECORDER/COUNTY CLERK
P.O. BOX 1750, MS A-33
1600 PACIFIC HWY, ROOM 260
SAN DIEGO, CA 92101-2422

_____ OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET, ROOM 121
SACRAMENTO, CA 95814

FROM: CITY OF SAN DIEGO
PUBLIC WORKS DEPARTMENT
525 B STREET, SUITE 750, MS 908A
SAN DIEGO, CA 92101

PROJECT NO.: S-00688.02.06 PROJECT TITLE: FIRE STATION NO. 5 TEMPORARY SPRUNG STRUCTURE

PROJECT LOCATION-SPECIFIC: 4311 Third Ave, San Diego, CA 92103

PROJECT LOCATION-CITY/COUNTY: San Diego/San Diego

DESCRIPTION OF NATURE, PURPOSE AND BENEFICIARIES OF PROJECT: Installation of a 40' x 60' sprung structure that will temporarily house Fire Department vehicles, including a fire engine/truck. The 2,400 SF sprung structure will be installed in an existing asphalt parking lot located on the property of 4311 Third Ave. The sprung structure has an architectural membrane consisting of a tensioned fabric and is supported with structural members. The sprung structure will be anchored by earth anchor with an ¾ inch diameter by five feet long at each of the 14 columns. The sprung structure is intended for temporary use until a permanent facility is identified and operational. The asphalt parking lot in which it will be installed will be restored back to its existing condition through patch work. Under a separate transaction, the Fire Department will be leasing an adjacent building to house firefighters which, in combination with the sprung structure, would function as a temporary Fire Station No. 5.

NAME OF PUBLIC AGENCY APPROVING PROJECT: San Diego/San Diego

NAME OF PERSON OR AGENCY CARRYING OUT PROJECT: City of San Diego Public Works Department,
Contact: Rowaida Jadan; Phone: (619) 533-6655
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)(b)(c))
(X) CATEGORICAL EXEMPTION: SEC. 15303 NEW CONSTRUCTION OR CONVERSION OF SMALL STRUCTURES (e); 15304 MINOR ALTERATIONS TO LAND (e)
( ) 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 15303 (New construction or conversion of small structures), which allows the construction of accessory structures, including garages, carports, etc.; and Section 15304 (Minor alterations to land), which allows for the minor temporary use of land having negligible or no effects on the environment, and where the exceptions listed in Section 15300.2 would not apply.

LEAD AGENCY CONTACT PERSON: JUAN BALIGAD, SENIOR PLANNER TELEPHONE: (619) 533-5473

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, PRINCIPAL PLANNER — DATE 2/18/16

CHECK ONE:
(X) SIGNED BY LEAD AGENCY
( ) SIGNED BY APPLICANT

DATE RECEIVED FOR FILING AT OPR:

APPENDIX B

FIRE HYDRANT METER PROGRAM

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
SUBJECT FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 1OF 10	EFFECTIVE DATE October 15, 2002
	SUPERSEDES DI 55.27	DATED April 21, 2000

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.)

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.

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.

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.

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

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

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

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.

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. Theses 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.

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).

Larry Gardner
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

City of San Diego
PUBLIC UTILITIES
Water & Wastewater

Application for Fire Hydrant Meter (EXHIBIT A)

METER SHOP (619) 527-7449

(For Office Use Only)

NS REQ	FAC#
DATE	BY

Application Date	Requested Install Date:

Meter Information

Fire Hydrant Location: (Attach Detailed Map//Thomas Bros. Map Location or Construction drawing.) Zip:	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: ☐ 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: (PERSON IN ACCOUNTS PAYABLE)			Phone: ( )
Site Contact Name and Title:			Phone: ( )
Responsible Party Name:			Title:
Cal ID#			Phone: ( )
Signature:	Date:		

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

☐ Fire Hydrant Meter Removal Request	Requested Removal Date:	
Provide Current Meter Location if Different from Above:		
Signature:	Title:	Date:
Phone: ( )	Pager: ( )	

☐ City Meter	☐ Private Meter	
Contract Acct #:	Deposit Amount: $ 936.00	Fees Amount: $ 62.00
Meter Serial #	Meter Size: 05	Meter Make and Style: 6-7
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)_____-_____.

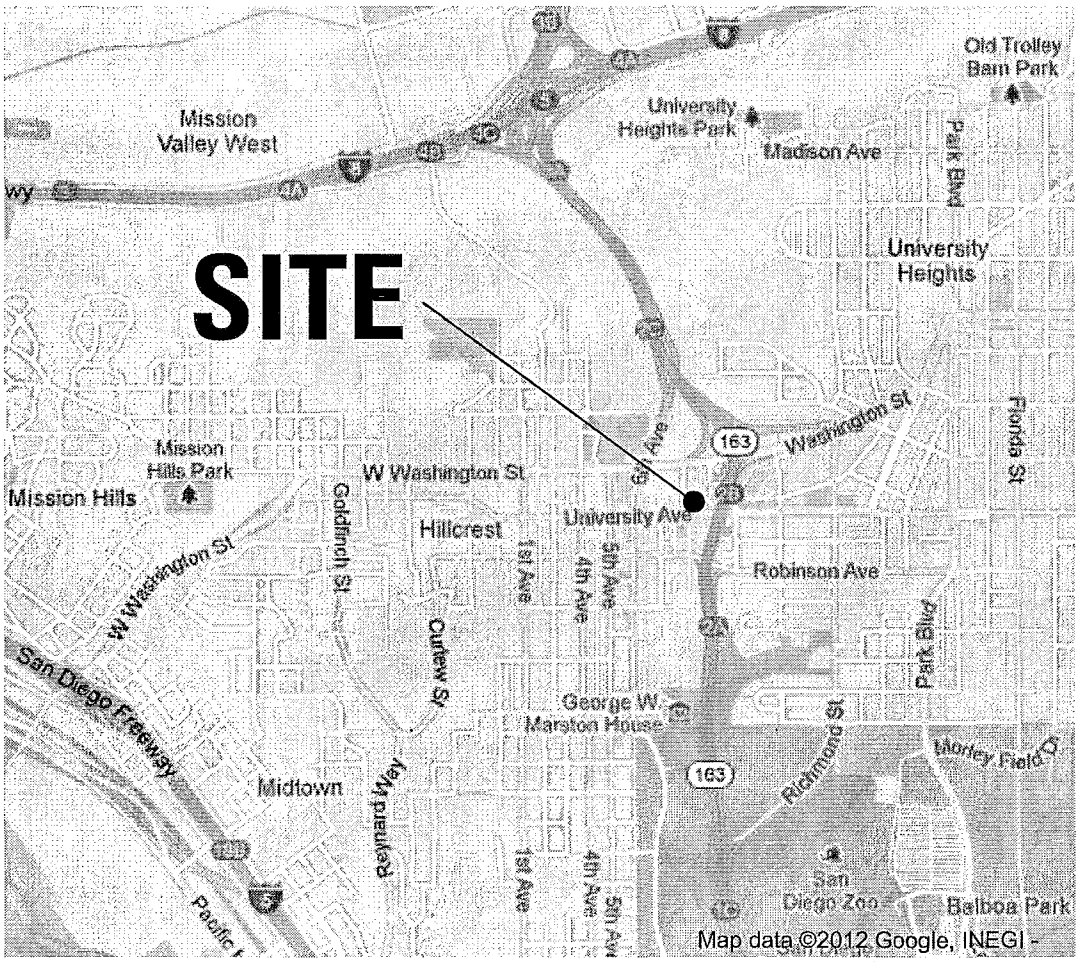
Sincerely,

Water Department

APPENDIX C

PERMANENT AND TEMPORARY STATION LOCATION MAPS

Permanent Fire Station No. 5



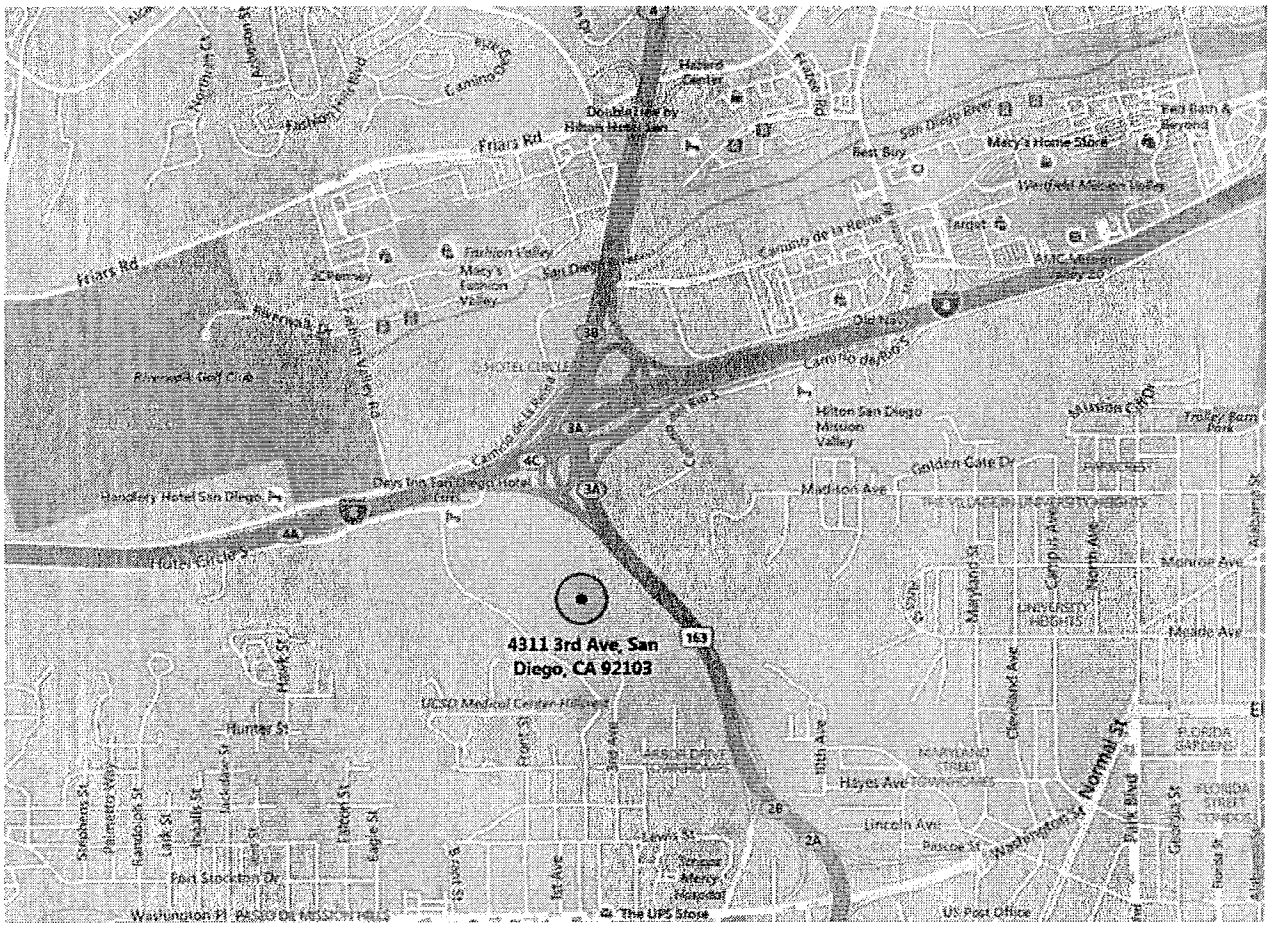
N

VICINITY MAP

NO SCALE

T0.0

Temporary Fire Station No. 5



N

VICINITY MAP

NO SCALE

APPENDIX D

PERMANENT, TEMPORARY AND ALLEY GEOTECHNICAL REPORTS

GEOTECHNICAL EVALUATION
FIRE STATION NO. 5 REPLACEMENT
3902 9TH AVENUE
SAN DIEGO, CALIFORNIA

PREPARED FOR:
Rob Wellington Quigley Architects
434 West Cedar Street
San Diego, California 92101

PREPARED BY:
Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

March 2, 2012
Project No. 107260001

March 2, 2012
Project No. 107260001

Mr. Bob Dickens
Rob Wellington Quigley Architects
434 West Cedar Street
San Diego, California 92101

Subject: Geotechnical Evaluation
Fire Station No. 5 Replacement
3902 9th Avenue
San Diego, California

Dear Mr. Dickens:

In accordance with your request and authorization, we are providing this geotechnical evaluation for proposed new facilities to replace the existing Fire Station No. 5 in San Diego, California. This report presents our geotechnical findings, conclusions, and recommendations regarding the proposed project. Our report was prepared in accordance with our proposal dated September 23, 2010.

We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

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Project Engineer

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Appendix A – Boring Logs
Appendix B – Laboratory Testing

1. INTRODUCTION

In accordance with your request, we are providing this geotechnical evaluation for the proposed replacement of the existing Fire Station No. 5 in San Diego, California. This report presents the results of our field exploration and laboratory testing, our conclusions regarding the geotechnical conditions at the subject site, and our recommendations for the design and earthwork construction of this project. We understand that a temporary fire station will be built to accommodate fire personnel during the demolition and construction operations. The geotechnical evaluation and recommendations for the temporary fire station is not a part of our revised scope.

2. SCOPE OF SERVICES

The scope of services for this study included the following:

- Reviewing readily available published and in-house geotechnical literature, topographic maps, geologic maps, fault maps, and stereoscopic aerial photographs.
- Performing a field reconnaissance to observe site conditions and to locate and mark the exploratory borings.
- Notifying the Underground Service Alert (USA) to clear the boring locations for the potential presence of underground utilities.
- Obtaining a permit from the County of San Diego, Department of Environmental Health (DEH).
- Performing a subsurface evaluation that consisted of the drilling, logging, and sampling of three exploratory borings. Relatively undisturbed and bulk soil samples were obtained at selected intervals from the borings.
- Performing of geotechnical laboratory testing on selected samples.
- Preparing this report presenting our findings, conclusions, and recommendations regarding the geotechnical design and construction of the project.

3. SITE AND PROJECT DESCRIPTION

Fire Station No. 5 site is located at 3902 9th Avenue in the Hillcrest community of the City of San Diego, California (Figure 1). Currently, the site consists of the fire station building, an asphalt-concrete paved parking lot, concrete hardscape, and landscaped areas. The site is relatively flat, with a gentle slope to the east. The site coordinates are approximately 32.7487°N latitude and -117.1566°W longitude. The ground elevation is approximately 292 feet above mean sea level (MSL).

Geotechnical reports concerning the existing fire station were not available for review. In 1992, a leaking underground storage tank (UST) was removed from the east-central portion of the property (Figure 2). The excavation depth of approximately 14.5 feet was backfilled with imported fill placed on top of a plastic liner (Geocon, 2003).

A new fire station will be constructed at the site of the existing Fire Station No. 5, which is to be demolished. The new fire station will be a two-story building with an area approximately 10,500 square feet that will be able to accommodate a crew of nine. A new parking lot will be constructed as part of the proposed improvements. We understand that the proposed fire station will be a wood frame and stucco building, including steel framing and trusses in the apparatus bay. We anticipate shallow spread or continuous footings with a slab-on-grade floor will be used for the proposed fire station.

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our subsurface exploration was conducted on February 8, 2012, and consisted of the drilling, logging, and sampling of three, small-diameter exploratory borings (B-1, B-2, and B-3). Borings were drilled to a depth of up to approximately 20 feet with a truck-mounted hollow-stem auger drill rig. Drive and bulk soil samples were obtained from the borings and transported to our in-house geotechnical laboratory for testing. The approximate locations of the exploratory borings are shown on Figure 2. Logs of the borings are included in Appendix A.

Laboratory testing of representative soil samples included an evaluation of in-situ dry density and moisture content, gradation analysis, direct shear analysis, expansion potential, soil corrosivity, and R-value. The results of in-situ dry density and moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests performed are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and local geology, including faulting and seismicity, landslides, and groundwater conditions at the subject site are provided in the following sections. A regional geologic map and fault location map are presented as Figures 3 and 4, respectively.

5.1. Regional Geologic Setting

The project area is situated in the coastal foothill section of the Peninsular Ranges Geomorphic Province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California (Norris and Webb, 1990; Harden, 1998). The province varies in width from approximately 30 to 100 miles. In general, the province consists of rugged mountains underlain by Jurassic metavolcanic and metasedimentary rocks, and Cretaceous igneous rocks of the southern California batholith.

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending approximately northwest. Several of these faults (Figure 4) are considered active faults. The Elsinore, San Jacinto, and San Andreas faults are active fault systems located northeast of the project area and the Rose Canyon, Coronado Bank, Newport-Inglewood, and San Clemente faults are active faults located west of the project area. The Rose Canyon Fault Zone, the nearest active fault system, has been mapped approximately 1½ miles west of the project site. Major tectonic activity associated with these and other faults within this regional tectonic framework consists primarily of right-lateral, strike-slip movement. Further discussion of faulting relative to the site is provided in the Faulting and Seismicity section of this report.

5.2. Site Geology

Geologic units encountered during our subsurface evaluation included fill materials, very old paralic deposits, and the San Diego Formation (Kennedy and Tan, 2008). Generalized descriptions of the earth units encountered during our subsurface exploration are provided in the subsequent sections. More detailed descriptions of the subsurface units are provided on the boring logs in Appendix A.

5.2.1. Fill

Fill materials were encountered in each of our borings to depths of approximately 2 feet. As encountered, these materials generally consisted of brown, moist, medium dense, clayey sand and stiff sandy clay with scattered gravel and cobbles. Fill depths are anticipated to be deeper (15 feet or more) at the existing and previous UST locations (Figure 2).

5.2.2. Very Old Paralic Deposits ($Qvop_8$)

Quaternary-age very old paralic deposits, formerly referred to as the Lindavista formation (Kennedy, 1975), were encountered in our exploratory borings below the fill to depths ranging from approximately 8 to 10 feet below the ground surface. As encountered, the materials generally consisted of reddish brown, damp to moist, weakly to moderately cemented, silty sandstone with scattered gravel and cobbles.

5.2.3. San Diego Formation (Tsd)

The Pliocene-age San Diego formation (Kennedy and Tan, 2008) was encountered in our exploratory borings below the very old paralic deposits, and extended to the bottom of each of our borings. As encountered, the materials generally consisted of light reddish brown, damp to moist, weakly cemented silty sandstone with scattered gravel and cobbles and light brownish gray to reddish brown, damp, weakly cemented, sandy siltstone.

5.3. Groundwater

Groundwater was not encountered in our exploratory borings up to a depth of 20 feet below ground surface. Groundwater was also not encountered in the environmental boring performed by Geocon, to a depth of 36.5 feet in 2003 (Geocon, 2003). Groundwater is anticipated to be deeper than 100 feet (Geotracker). However, fluctuations in the groundwater level and local perched conditions may occur due to variations in ground surface topography, subsurface geologic conditions and structure, rainfall, irrigation, and other factors.

5.4. Faulting and Seismicity

Based on our review of the referenced geologic maps and stereoscopic aerial photographs, as well as on our geologic field mapping, the subject site is not underlain by known active or potentially active faults (i.e., faults that exhibit evidence of ground displacement in the last 11,000 years and 2,000,000 years, respectively). However, the site is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion is considered significant during the design life of the proposed structure. The nearest known active fault is the Rose Canyon fault, located approximately 1½ miles west of the site. Table 1 lists selected principal known active faults that may affect the subject site, the maximum moment magnitude (M_{max}) and the fault types as published for the California Geological Survey (CGS) by Cao et al. (2003). The approximate fault to site distance was calculated by the computer program FRISKSP (Blake, 2001).

Table 1 – Principal Active Faults

Fault	Distance miles (kilometers) [1]	Moment Magnitude/ Fault Type [1,2]
Rose Canyon	1.5 (2.3)	7.2/B
Coronado Bank	14 (23)	7.6/B
Newport-Inglewood (Offshore)	32 (52)	7.1/B
Elsinore (Julian Segment)	40 (64)	7.1/A
Elsinore (Temecula Segment)	44 (71)	6.8/A
Earthquake Valley	45 (72)	6.5/B

Table 1 – Principal Active Faults

Fault	Distance miles (kilometers) [1]	Moment Magnitude/ Fault Type [1,2]
Elsinore (Coyote Mountain Segment)	49 (78)	6.8/A
Palos Verdes	59 (94)	7.3/B
San Jacinto (Coyote Creek Segment)	61 (99)	6.8/A
San Jacinto (Anza Segment)	62 (99)	7.2/A
Notes: [1] Blake (2001) [2] Cao, et al. (2003)		

In general, hazards associated with seismic activity include strong ground motion, ground rupture, liquefaction, seismically induced settlement, and tsunamis. These hazards are discussed in the following sections.

5.4.1. Strong Ground Motion

Based on our review of background information, data pertaining to the historical seismicity of the San Diego area are summarized in Table 2. This table presents historic earthquakes within a radius of approximately 62 miles (i.e., 100 kilometers) of the site with a magnitude of 6.0 or greater.

Table 2 – Historical Earthquakes that Affected the Site

Date	Magnitude (M)	Approximate Epicentral Distance miles (kilometers)
November 22, 1800	6.5	19 (30)
February 24, 1892	6.7	50 (80)

The 2010 California Building Code (CBC) recommends that the design of structures be based on the peak horizontal ground acceleration (PGA) having a 2 percent probability of exceedance in 50 years which is defined as the Maximum Considered Earthquake (MCE). The statistical return period for PGA_{MCE} is approximately 2,475 years. In evaluating the seismic hazards associated with the project site, we have used a Site Class D. The site modified PGA_{MCE} is an estimated 0.62g using the United States Geological Survey (USGS) (USGS, 2011) ground motion calculator (web-based). The design PGA was 0.41g using the

USGS ground motion calculator. These estimates of ground motion do not include near-source factors that may be applicable to the design of structures on site.

5.4.2. Ground Rupture

Based on our review of the referenced literature and our site reconnaissance, no active faults are known to cross the project vicinity. Therefore, the potential for ground rupture due to faulting at the site is considered low. However, lurching or cracking of the ground surface as a result of nearby seismic events is possible.

5.4.3. Liquefaction and Seismically Induced Settlement

Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Research and historical data indicate that loose granular soils and non-plastic silts that are saturated by a relatively shallow groundwater table are more susceptible to liquefaction. Based on the relatively dense nature of the materials encountered and absence of a shallow groundwater table, it is our opinion that liquefaction and seismically induced settlement at the subject site are not design considerations.

5.4.4. Tsunamis

Tsunamis are long wavelength seismic sea waves (long compared to the ocean depth) generated by sudden movements of the ocean bottom during submarine earthquakes, landslides, or volcanic activity. Based on the inland location and elevation of the site, the potential for a tsunami to affect the site is not a design consideration.

5.5. Landsliding

Based on our review of published landslide hazard maps (Tan, 1995, City of San Diego, 2008), other published geologic literature, and aerial photographs and our subsurface evaluation, no landslides or related features underlie or are adjacent to the subject site.

6. CONCLUSIONS

Based on our review of the referenced background data, subsurface evaluation, and laboratory testing, it is our opinion that construction of the proposed fire station and improvements is feasible from a geotechnical standpoint provided the recommendations presented in this report are incorporated into the design and construction of the project. In general, the following conclusions were made:

- Fill materials were encountered to a depth of approximately 2 feet in our borings. Fill depths are anticipated to be deeper (15 feet or more) at the existing and previous UST locations (Figure 2). Fill material is not suitable for structural support in its current condition.
- Materials of the very old paralic deposits and the San Diego formation are considered suitable for structural support of the proposed improvements.
- Based on our subsurface exploration, excavation of the subsurface materials should be feasible with heavy-duty excavation equipment in good working condition. However, if cobbles or cemented zones are encountered, additional effort including heavy ripping may be needed during excavation.
- On-site soils derived from the earthwork operations as defined in Materials for Fill (Section 7.1.3), are generally considered suitable for reuse as compacted fill and backfill.
- Groundwater was not encountered in our borings to a depth of up to approximately 20 feet below ground surface. Consequently, groundwater is not anticipated to be a design consideration. However, perched zones and seepage may be encountered in some areas (including tank backfill).
- The active Rose Canyon fault zone is located approximately 1½ miles west of the site. Accordingly, the potential for relatively strong seismic ground motions should be considered in the project design.
- Based on the results of our soil corrosivity tests presented in the following sections, the site would be classified as corrosive.

7. RECOMMENDATIONS

Based on our understanding of the project, the following recommendations are provided for the design and construction of the proposed new fire station and improvements. The proposed site improvement should be constructed in accordance with the requirements of the applicable governing agencies.

7.1. Earthwork

In general, earthwork should be performed in accordance with the recommendations presented in this report. Ninyo & Moore should be contacted for questions regarding the recommendations or guidelines presented herein.

7.1.1. Site Preparation

Site preparation should begin with the removal of existing structures and improvements, vegetation, utility lines, underground storage tanks, asphalt, concrete, and other deleterious debris from areas to be graded. Tree stumps and roots should be removed to such a depth that organic material is generally not present. Clearing and grubbing should extend to the outside of the proposed excavation and fill areas. The debris and unsuitable material generated during clearing and grubbing should be removed from areas to be graded and disposed of at a legal dumpsite away from the project area. Soils in areas disturbed by demolition activities should be replaced as compacted fill.

7.1.2. Excavation Characteristics

The results of our field exploration program indicate that the project site, as presently proposed, is underlain by fill materials, which are underlain by very old paralic deposits and the San Diego formation. Excavation of the subsurface materials should be feasible with heavy-duty excavation equipment in good working condition. However, if cobbles or cemented zones are encountered, additional effort including heavy ripping may be needed during excavation.

7.1.3. Materials for Fill

Laboratory testing indicates the onsite soils have moderate potential for expansion. Therefore, the on-site soils should be processed before being re-used as fill. The fill material should exhibit an expansion index (EI) of 50 or less (i.e., low expansion potential) as evaluated by ASTM International (ASTM) D 4829 and are free of trash, debris, roots, vegetation, or other deleterious materials. Fill should generally be free of rocks or lumps of material in excess of 3 inches in diameter and not more than approximately 30 percent larger than ¾ inch. Rocks or

hard lumps larger than approximately 3 inches in diameter should be broken into smaller pieces or should be removed from the site. Contaminated materials should not be used as fill. Moisture conditioning (including drying) of existing on-site materials is anticipated if reused as fill.

Fill material imported to the site should consist of clean, granular material that generally meets Standard Specifications for Public Works Construction (Greenbook) criteria for structure backfill. Import material should consist of clean, granular soils with an EI of 50 or less. Soil should also be tested for corrosive properties prior to importing. We recommend that the imported materials satisfy the Caltrans (2003) criteria for non-corrosive soils (i.e., soils having a chloride concentration of 500 parts per million [ppm] or less, a soluble sulfate content of approximately 0.20 percent (2,000 ppm) or less, a pH value of 5.5 or higher, or an electrical resistivity of 1,000 ohm-cm or higher). Materials for use as fill should be evaluated by Ninyo & Moore prior to importing. The contractor should be responsible for the uniformity of import material brought to the site.

To reduce the potential of importing contaminated materials to the site, prior to delivery, soil materials obtained from off-site sources shall be sampled and tested in compliance with CA EPA Department of Toxic Substances Control "Information Advisory, Clean Imported Fill Material", dated October 2001. Do not import soils that exhibit a known risk to human health, the environment or both.

7.1.4. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified to a depth of approximately 8 inches and watered or dried, as needed, to achieve generally consistent moisture contents at or near the optimum moisture content. The scarified materials should then be compacted to 90 percent relative compaction in accordance with ASTM D 1557. The evaluation of compaction by Ninyo & Moore should not be considered to preclude any requirements

for observation or approval by governing agencies. It is the contractor's responsibility to notify Ninyo & Moore and the appropriate governing agency when project areas are ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to near optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve near optimum moisture condition, mixed, and then compacted by mechanical methods, using sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other appropriate compacting rollers, to a relative compaction of 90 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

7.1.5. Cut/Fill Transition

Once the recommended removal of fill soils in the UST location is performed, the building footings may be underlain by a cut/fill transition. In order to mitigate the potential for differential settlement from a cut/fill transition, we recommend that the excavations resulting from the removal of UST be backfilled with three sack cement sand slurry. As an alternative, the excavations may be backfilled and compacted as recommended in the Materials for Fill and Compacted Fill (Sections 7.1.3 and 7.1.4), and the footings should be deepened to be supported on very old paralic deposits or San Diego formation.

7.1.6. Utility Trench Backfill

Based on our subsurface evaluation, the on-site earth materials should be generally suitable for re-use as trench backfill provided they are free of organic material, clay lumps, debris, and rocks greater than approximately 3 inches in diameter. We recommend that trench backfill materials be in conformance with the "Greenbook" (Standard Specifications for Public Works) specifications for structure backfill. Fill should be moisture-conditioned to generally above the laboratory optimum. Trench backfill should be compacted to a relative compaction of 90 percent as evaluated by ASTM D 1557 except for the upper 12 inches of the backfill that should be compacted to a relative compaction of 95 percent as evaluated by ASTM D 1557. Lift thickness for backfill will depend on the type of compaction equipment utilized, but fill should generally be placed in lifts not exceeding 8 inches in loose thickness. Special care should be exercised to avoid damaging the pipe during compaction of the backfill.

7.1.7. Temporary Excavations

For temporary excavations, we recommend that the following Occupational Safety and Health Administration (OSHA) soil classifications be used:

Fill	*Type C*
Very Old Paralic Deposits and San Diego Formation	*Type B*

Upon making the excavations, the soil classifications and excavation performance should be evaluated in the field by the geotechnical consultant in accordance with the OSHA regulations. Temporary excavations should be constructed in accordance with OSHA recommendations. For trench or other excavations, OSHA requirements regarding personnel safety should be met using appropriate shoring (including trench boxes) or by laying back the slopes to a slope ratio no steeper than 1.5:1 (horizontal:vertical) in fill and 1:1 (horizontal:vertical) in very old paralic deposits or materials of the San Diego formation. Temporary excavations that encounter seepage may be shored or stabilized by placing sandbags or gravel along the base of the seepage zone. Excavations encountering seepage should be evaluated on a case-by-case basis. On-site safety of personnel is the responsibility of the contractor.

7.1.8. Temporary Shoring

If shoring or bracing is required for temporary excavations, including UST removal, the following recommendations may be used. Temporary earth retaining systems will be subjected to lateral loads resulting from earth pressures. Shoring systems for excavations may be designed using the lateral earth pressure parameters presented on Figures 5 and 6. These lateral earth pressures should be evaluated by a structural engineer for the design of the shoring systems. These design earth pressures assume that spoils from the excavations, or other surcharge loads, will not be placed above the excavations within a 1:1 (horizontal:vertical) plane extending up and back from the base of the excavation. For bracing subjected to surcharge loads, such as soil stockpiles or construction materials/equipment, an additional horizontal uniform pressure of 0.40q may be applied to the full height of the excavation, where "q" is the surcharge pressure.

7.1.9. Thrust Blocks

Thrust restraint for buried pipelines may be achieved by transferring the thrust force to the soil outside the pipe through a thrust block. Thrust blocks may be designed using the magnitude and distribution of passive lateral earth pressures presented on Figure 7. Thrust blocks should be backfilled with granular backfill material and compacted following the recommendations presented in this report.

7.1.10. Drainage

Roof, pad, and slope drainage should be directed such that runoff water is diverted away from slopes and structures to suitable discharge areas by nonerodible devices (e.g., gutters, downspouts, concrete swales, etc.). Positive drainage adjacent to structures should be established and maintained. Positive drainage may be accomplished by providing drainage away from the foundations of the structure at a gradient of 2 percent or steeper for a distance of 5 feet or more outside the building perimeter, and further maintained by a graded swale leading to an appropriate outlet, in accordance with the recommendations of the project civil engineer and/or landscape architect.

Surface drainage on the site should be provided so that water is not permitted to pond. A gradient of 2 percent or steeper should be maintained over the pad area and drainage patterns should be established to divert and remove water from the site to appropriate outlets.

Care should be taken by the contractor during final grading to preserve any berms, drainage terraces, interceptor swales or other drainage devices of a permanent nature on or adjacent to the property. Drainage patterns established at the time of final grading should be maintained for the life of the project. The property owner and the maintenance personnel should be made aware that altering drainage patterns might be detrimental to slope stability and foundation performance.

7.1.11. Seismic Design Parameters

The proposed improvements should be designed in accordance with the requirements of governing jurisdictions and applicable building codes. Table 3 presents the seismic design parameters for the site in accordance with CBC (2010) guidelines and mapped spectral acceleration parameters (United States Geological Survey [USGS], 2011).

Table 3 – 2010 California Building Code Seismic Design Criteria

Seismic Design Factors	Values
Site Class	D
Site Coefficient, F_a	1.0
Site Coefficient, F_v	1.5
Mapped Short Period Spectral Acceleration, S_S	1.55 g
Mapped One-Second Period Spectral Acceleration, S_1	0.59 g
Short Period Spectral Acceleration Adjusted For Site Class, S_{MS}	1.55 g
One-Second Period Spectral Acceleration Adjusted For Site Class, S_{M1}	0.89 g
Design Short Period Spectral Acceleration, S_{DS}	1.03 g
Design One-Second Period Spectral Acceleration, S_{D1}	0.59 g

7.2. Foundations

Based on our understanding of the project, it is anticipated that the proposed fire station building will be supported on shallow, spread or continuous footings bearing on very old paralic deposits. Based on our review of the referenced schematic plans, we do not anticipate footings in the area of removed UST or the area of existing UST that will be removed. If footings are planned in these locations, they should be deepened to be supported on very old paralic deposits or San Diego formation. Foundations should be designed in accordance with structural considerations and the following recommendations. In addition, requirements of the appropriate governing jurisdictions and applicable building codes should be considered in the design of the structures.

7.2.1. Shallow Footings

Shallow footings, either spread or continuous footings, founded in cement sand slurry, very old paralic deposits or San Diego formation may be designed using a net allowable bearing capacity of 3,000 pounds per square foot (psf). These allowable bearing capacities may be increased by one-third when considering loads of short duration such as wind or seismic forces. These allowable bearing capacities are based on a factor of safety of roughly three.

Spread footings should be founded 24 inches below the lowest adjacent grade. Continuous footings should have a width of 15 inches or more and isolated footings should be 24 inches or more in width. The spread footings should be reinforced in accordance with the recommendations of the project structural engineer.

7.2.2. Lateral Resistance

For resistance of footings to lateral loads founded in very old paralic deposits or San Diego formation, we recommend an allowable passive pressure of 350 psf of depth be used with a value of up to 3,500 psf. This value assumes that the ground is horizontal for a distance of 10 feet, or three times the height generating the passive pressure, whichever is greater. We recommend that the upper 1 foot of soil not protected by pavement or a concrete slab be neglected when calculating passive resistance.

For frictional resistance to lateral loads, we recommend a coefficient of friction of 0.35 be used between soil and concrete. The allowable lateral resistance can be taken as the sum of the frictional resistance and passive resistance provided the passive resistance does not exceed one-half of the total allowable resistance. The passive resistance values may be increased by one-third when considering loads of short duration such as wind or seismic forces.

7.2.3. Static Settlement

We estimate that the proposed structures, designed and constructed as recommended herein, will undergo total settlement on the order of 1 inch. Differential settlement on the order of ½ inch over a horizontal span of 40 feet should be expected.

7.2.4. Floor Slabs for Non Apparatus Bay

We recommend that conventional, slab-on-grade floors, not subjected to vehicular loading, be underlain by very low to low expansive compacted fill or very old paralic deposits, be 5 or more inches in thickness and be reinforced with No. 3 or larger reinforcing bars spaced 18 inches on center each way. The reinforcing bars should be placed near the mid-point of the slabs. As a means to help reduce shrinkage cracks, we recommend that the slabs be provided with expansion joints at intervals of approximately 15 to 20 feet, each way or as recommended by the structural engineer. The slab reinforcement and expansion joint spacing should be designed by the structural engineer.

If moisture sensitive floor coverings are to be used, we recommend that slabs be underlain by a vapor retarder and capillary break system consisting of a 10-mil polyethylene (or equivalent) membrane placed over 4 inches of coarse sand or gravel and overlain by an additional 2 inches of clean sand to help protect the membrane from puncture during placement and to aid in concrete curing. The exposed subgrade should be moistened just prior to the placement of concrete.

7.2.5. Floor Slabs for Apparatus Bay

For preliminary planning purposes, we recommend that the fire apparatus bay floor slabs be designed as rigid pavements per Rigid Pavement Design (Section 7.7) of this report. Final design of the bay slab section should be based on R-value testing of finish grade soils after completion of grading.

7.3. Concrete Flatwork

Exterior concrete flatwork should be 4 inches in thickness and should be reinforced with No. 3 reinforcing bars placed at 24 inches on-center both ways. No vapor retarder is needed for exterior flatwork. To reduce the potential manifestation of distress to exterior concrete flatwork due to movement of the underlying soil, we recommend that such flatwork be installed with crack-control joints at appropriate spacing as designed by the structural engineer. Exterior slabs should be underlain by 4 inches of clean sand. The subgrade soils should be scarified to a depth of 12 inches, moisture conditioned to generally above the laboratory optimum moisture content, and compacted to a relative compaction of 90 percent as evaluated by ASTM D 1557. Positive drainage should be established and maintained adjacent to flatwork.

7.4. Corrosion

Laboratory testing was performed on a representative sample of the on-site earth materials to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with California Test (CT) 643 and the sulfate and chloride content tests were performed in accordance with CT 417 and CT 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing indicated an electrical resistivity of 800 ohm-cm, a soil pH of 7.5, a chloride content of 200 parts per million (ppm) and a sulfate content of 0.035 percent (i.e., 350 ppm). Based on the Caltrans corrosion (2003) criteria, ACI 318, and our experience, the on-site soils would be classified as corrosive. Corrosive soils are defined as the soils with electrical resistivities less than 1,000 ohm-cm, more than 500 ppm chlorides, more than 0.1 percent sulfates, or a pH less than 5.5.

7.5. Concrete

Concrete in contact with soil or water that contains high concentrations of water-soluble sulfates can be subject to premature chemical and/or physical deterioration. As stated above, the soil sample tested in this evaluation indicated a water-soluble sulfate content of 0.035 percent by weight (i.e., about 350 ppm). According to the American Concrete Institute (ACI) 318, the potential for sulfate attack is negligible for water-soluble sulfate content of up to about 0.10 percent by weight (i.e., 1,000 ppm) in soils. Therefore, the site soils may be considered to have a negligible potential for sulfate attack. . However, due to the potential variability of site soils, we recommend using Type II/V cement and/or incorporating fly-ash into the concrete mix as well as maintaining a water to cement ratio of 0.45, and a 28-day compressive strength of 4,500 pounds per square inch (psi) or more for the project.

7.6. Flexible Pavement Design

Laboratory testing of onsite soil material indicates an R-value of 21. We have used an R-value of 20 for the preliminary design of flexible pavements at the project site. Actual pavement recommendations should be based on R-value tests performed on bulk samples of the soils that are exposed at the finished subgrade elevations across the site at the completion of the mass grading operations.

We understand that traffic will consist primarily of automobiles, light trucks, trash trucks, and fire engines. For design we have assumed Traffic Indices (TI) of 7.0 and 8.0 for site pavements. We recommend that the geotechnical consultant re-evaluate the pavement design, based on the R-value of the subgrade material exposed at the time of construction. The preliminary recommended pavement sections are presented in Table 4.

Table 4 – Recommended Preliminary Pavement Sections

Traffic Index	R-Value	Asphalt Concrete (in)	Class 2 Aggregate Base (in)
7.0	20	4.5	11.0
8.0	20	5.0	13.5

As indicated, these values assume traffic indices of 7.0 and 8.0 for site pavements. In addition, we recommend that the upper 12 inches of the subgrade and base materials be compacted to a relative compaction of 95 percent relative density as evaluated by the current version of ASTM D 1557. If traffic loads are different from those assumed, the pavement design should be re-evaluated.

7.7. Rigid Pavement Design

In areas of rigid pavement, we recommend that the upper 12 inches of the subgrade be compacted to a relative compaction of 95 percent of the laboratory Proctor density as evaluated by ASTM D 1557. We recommend that in these areas, 8 inches of 600 psi flexural strength Portland cement concrete reinforced with No. 3 bars, 18 inches on-center, be used. We recommend that the geotechnical consultant re-evaluate the pavement design, based on the R-value of the subgrade material exposed at the time of construction.

7.8. Pre-Construction Conference

We recommend that a pre-construction meeting be held prior to commencement of grading. The owner or his representative, the agency representatives, the architect, the civil engineer, Ninyo & Moore, and the contractor should attend to discuss the plans, the project, and the proposed construction schedule.

7.9. Plan Review and Construction Observation

The conclusions and recommendations presented in this report are based on analysis of observed conditions in widely spaced exploratory borings. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations.

The recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in this report. Construction of proposed improvements should be performed by qualified subcontractors utilizing appropriate techniques and construction materials.

8. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

9. REFERENCES

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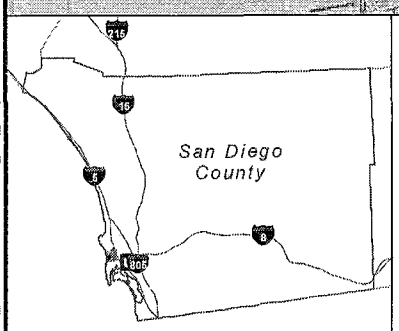
AERIAL PHOTOGRAPHS				
Source	**Date**	**Flight**	**Numbers**	**Scale**
USDA	March 31, 1953	AXN-3M	193 and 194	1:20,000

SOURCE: 2008 Thomas Guide for San Diego County, Street Guide and Directory; Map © Rand McNally, R.L.07-S-129



MAP INDEX

SCALE IN FEET

0 1,200 2,400 4,800

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore	SITE LOCATION	FIGURE
PROJECT NO. / DATE	FIRE STATION NO. 5 REPLACEMENT 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	1
107260001 / 3/12		

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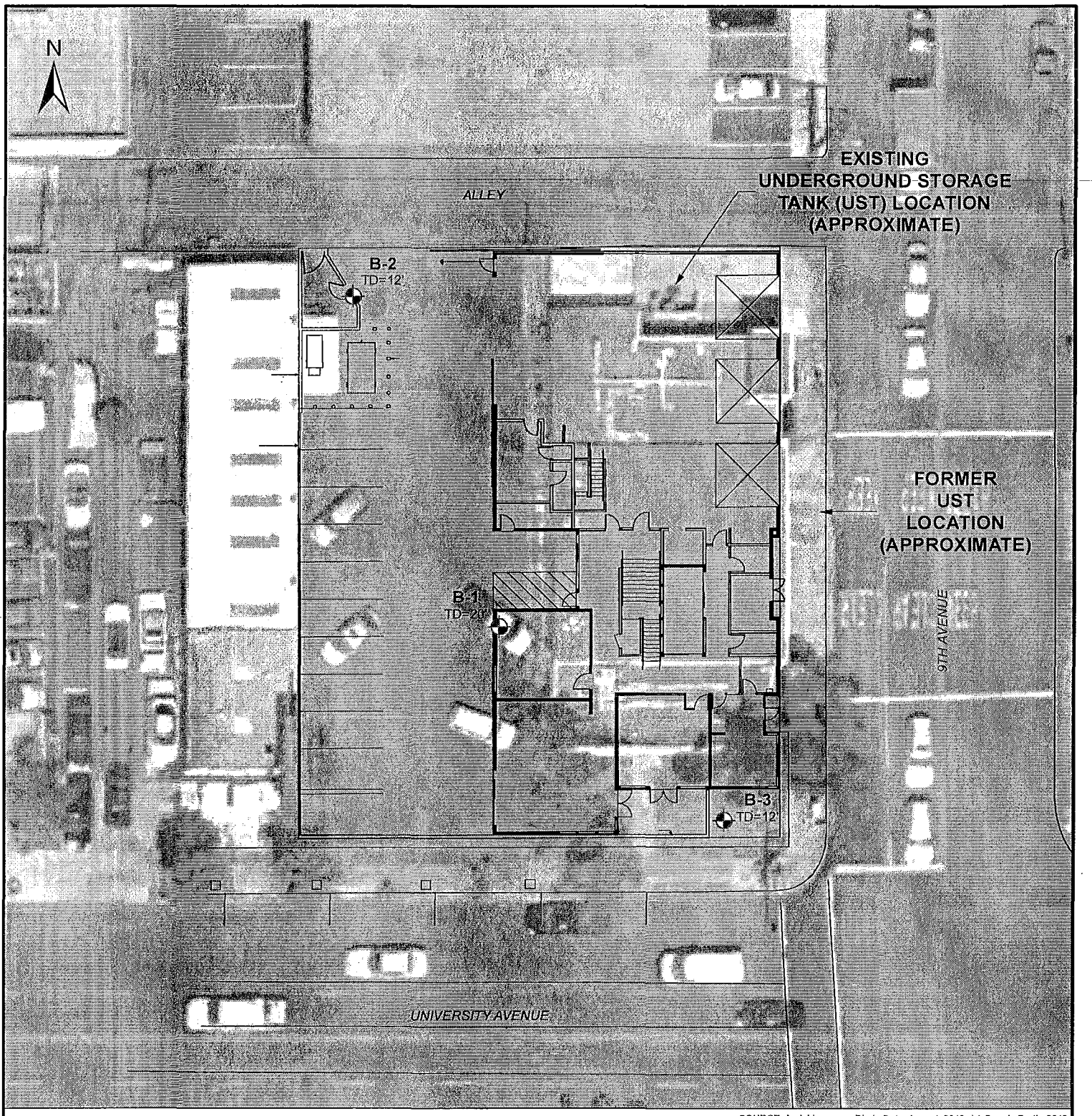

SOURCE: Aerial Imagery - Photo Date: August, 2012; (c) Google Earth, 2012

LEGEND

B-3 BORING
TD=12' TD=TOTAL DEPTH IN FEET

SCALE IN FEET

0 15 30 60

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	BORING LOCATIONS	FIGURE
PROJECT NO. 107260001 / DATE 3/12	FIRE STATION NO. 5 REPLACEMENT 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	2

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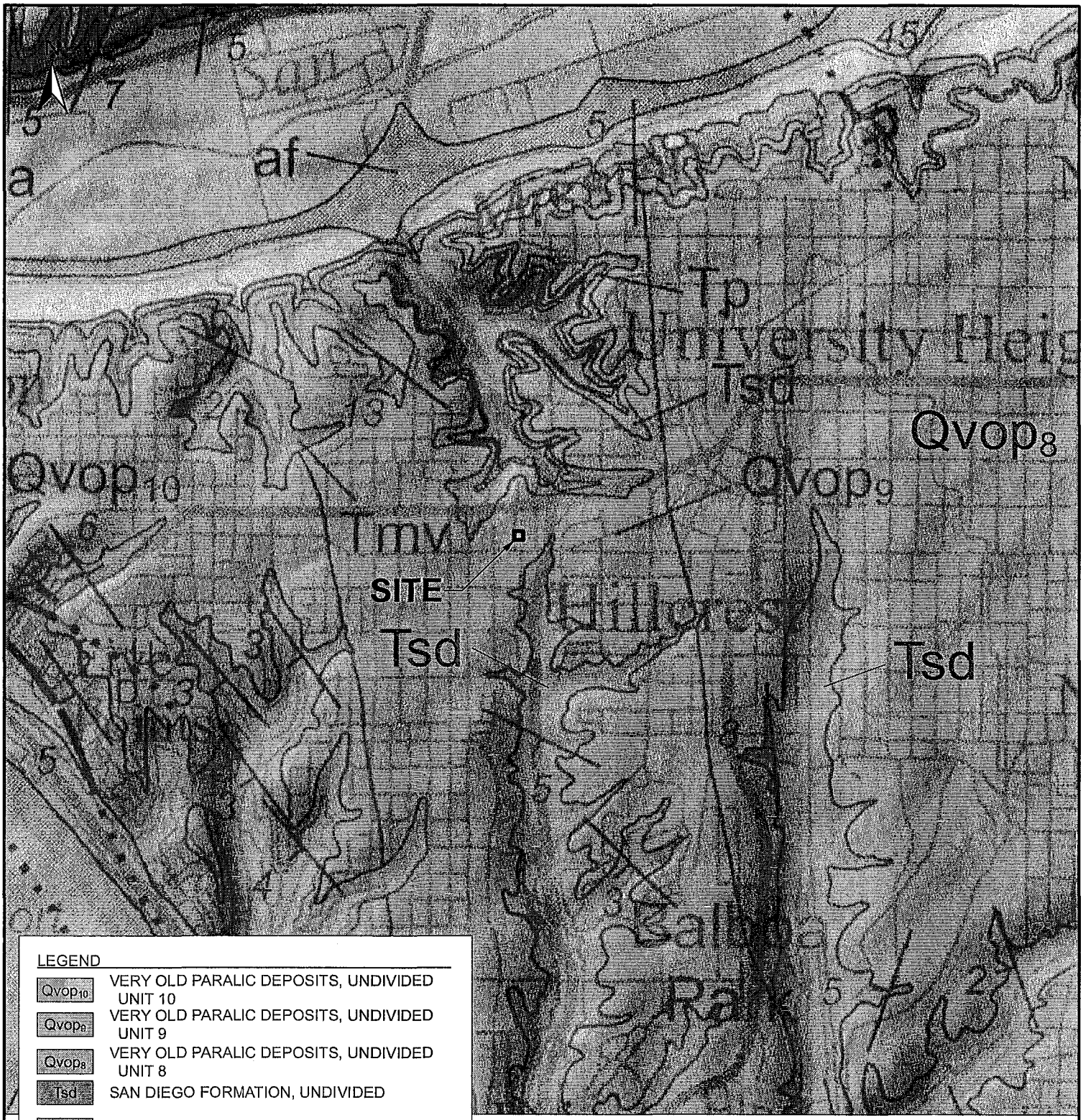

LEGEND

- $Qvop_{10}$ — VERY OLD PARALIC DEPOSITS, UNDIVIDED UNIT 10
- $Qvop_9$ — VERY OLD PARALIC DEPOSITS, UNDIVIDED UNIT 9
- $Qvop_8$ — VERY OLD PARALIC DEPOSITS, UNDIVIDED UNIT 8
- Tsd — SAN DIEGO FORMATION, UNDIVIDED
- Tp — POMERADO CONGLOMERATE
- Tmv — MISSION VALLEY FORMATION
- 13 — STRIKE AND DIP OF BEDS, INCLINED
- FAULT - SOLID WHERE ACCURATELY LOCATED, DASHED WHERE APPROXIMATELY LOCATED

SOURCE: KENNEDY, M.P., AND TAN, S.S., 2008, GEOLOGIC MAP OF THE SAN DIEGO 30' X 60' QUADRANGLE, CALIFORNIA

SCALE IN FEET

0 1,000 2,000 4,000

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	GEOLOGY	FIGURE
PROJECT NO. 107260001 / DATE 3/12	FIRE STATION NO. 5 REPLACEMENT 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	3

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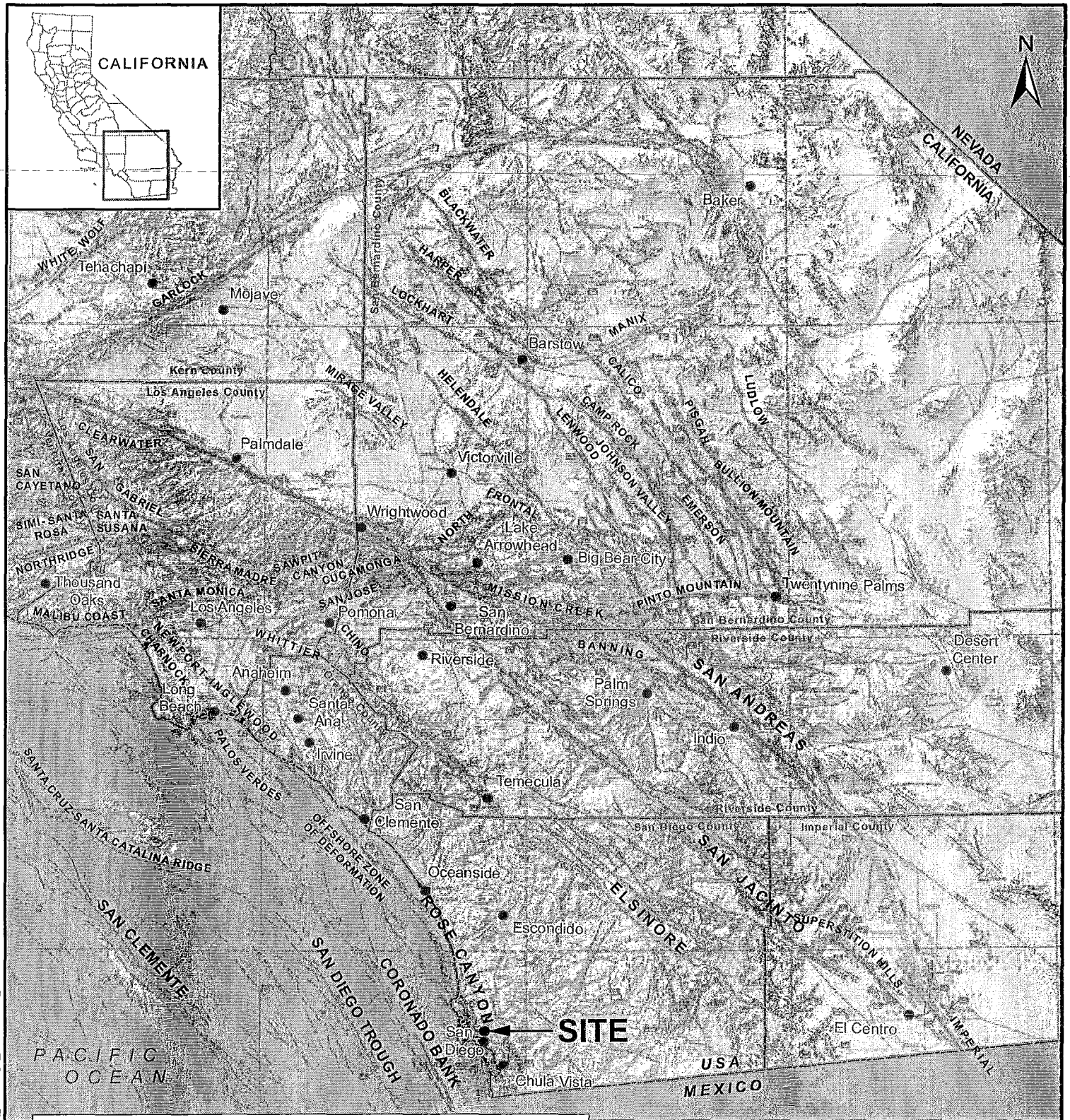

LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

SOURCE: Fault Activity Map of California, 2010, Jennings, C.W., and Bryant, W.A., California Geological Survey.

SCALE IN MILES

0 30 60

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore

FAULT LOCATIONS

FIGURE 4

PROJECT NO.	DATE
107260001	3/12

FIRE STATION NO. 5 REPLACEMENT
3902 9TH AVENUE
SAN DIEGO, CALIFORNIA

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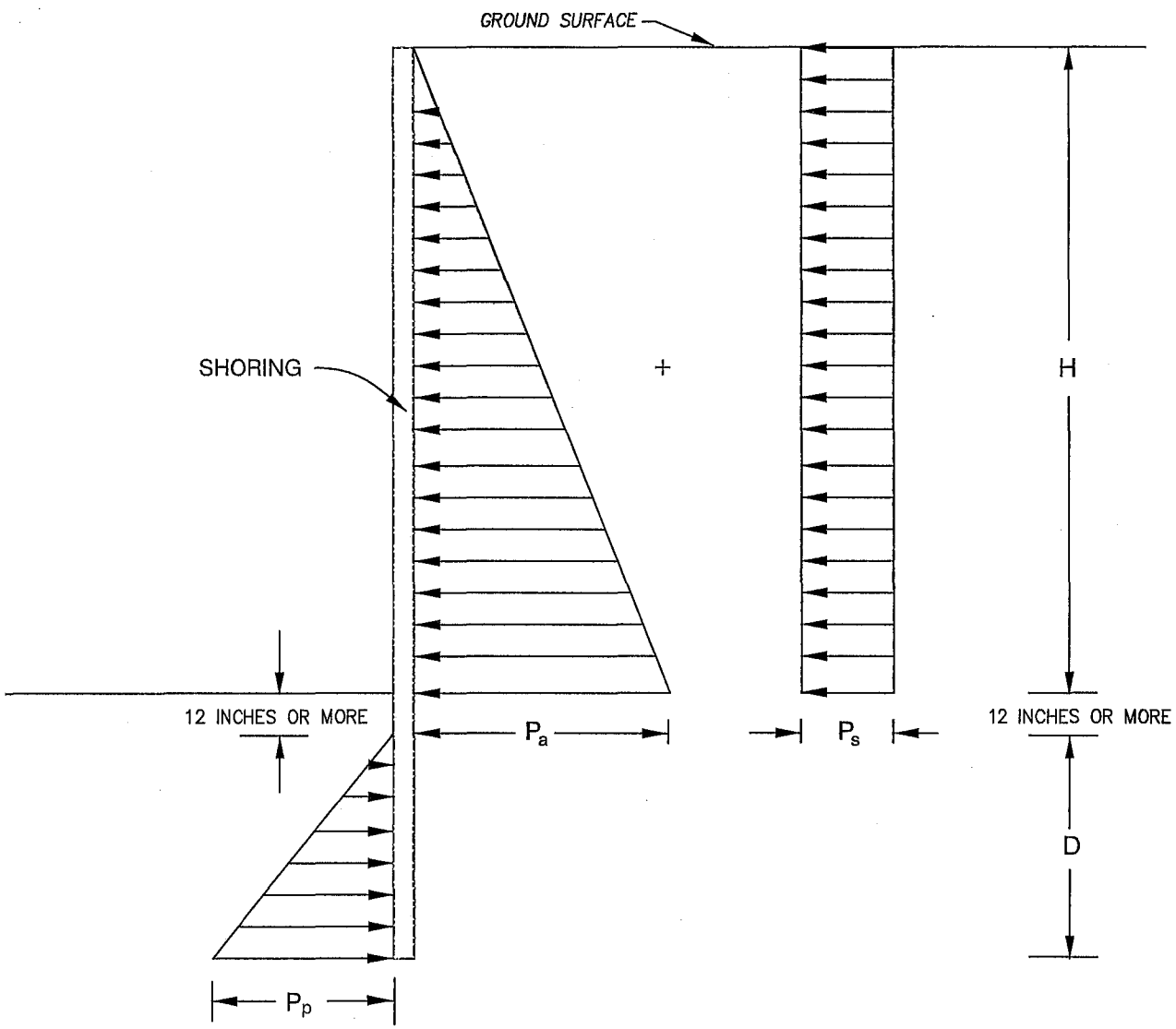


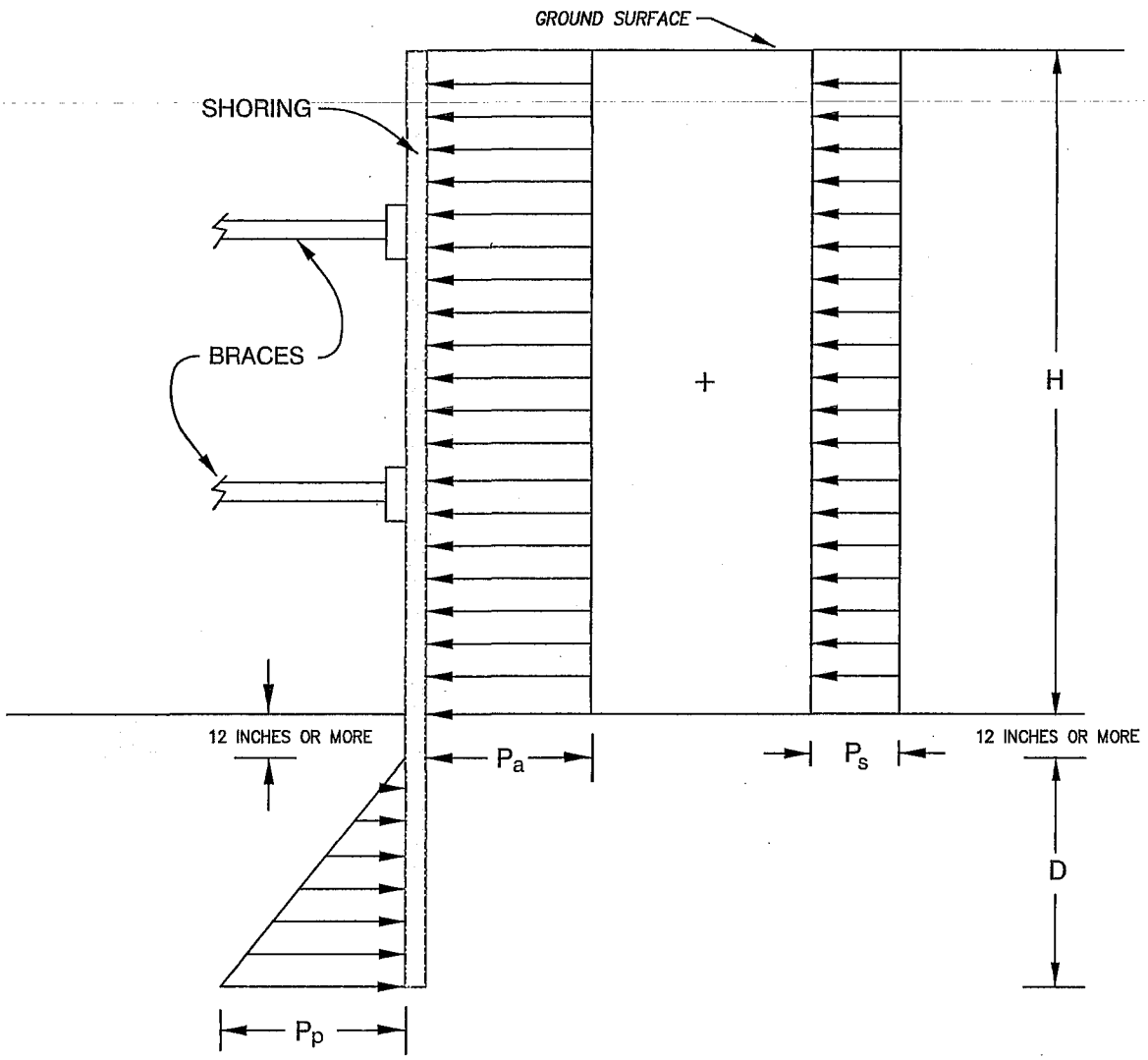
NOTES:

1. ACTIVE LATERAL EARTH PRESSURE, P_a
   $P_a = 37\ H$ psf
2. CONSTRUCTION TRAFFIC INDUCED SURCHARGE PRESSURE, P_s
   $P_s = 120$ psf
3. PASSIVE LATERAL EARTH PRESSURE, P_p
   $P_p = 350\ D$ psf
4. ASSUMES GROUNDWATER IS NOT PRESENT
5. H AND D ARE IN FEET

NOT TO SCALE

fig5 107260001 cant shor.dwg

Ninyo & Moore	LATERAL EARTH PRESSURES FOR TEMPORARY CANTILEVERED SHORING	FIGURE
PROJECT NO. 107260001 / DATE 3/12	FIRE STATION NO. 5 REPLACEMENT 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	5



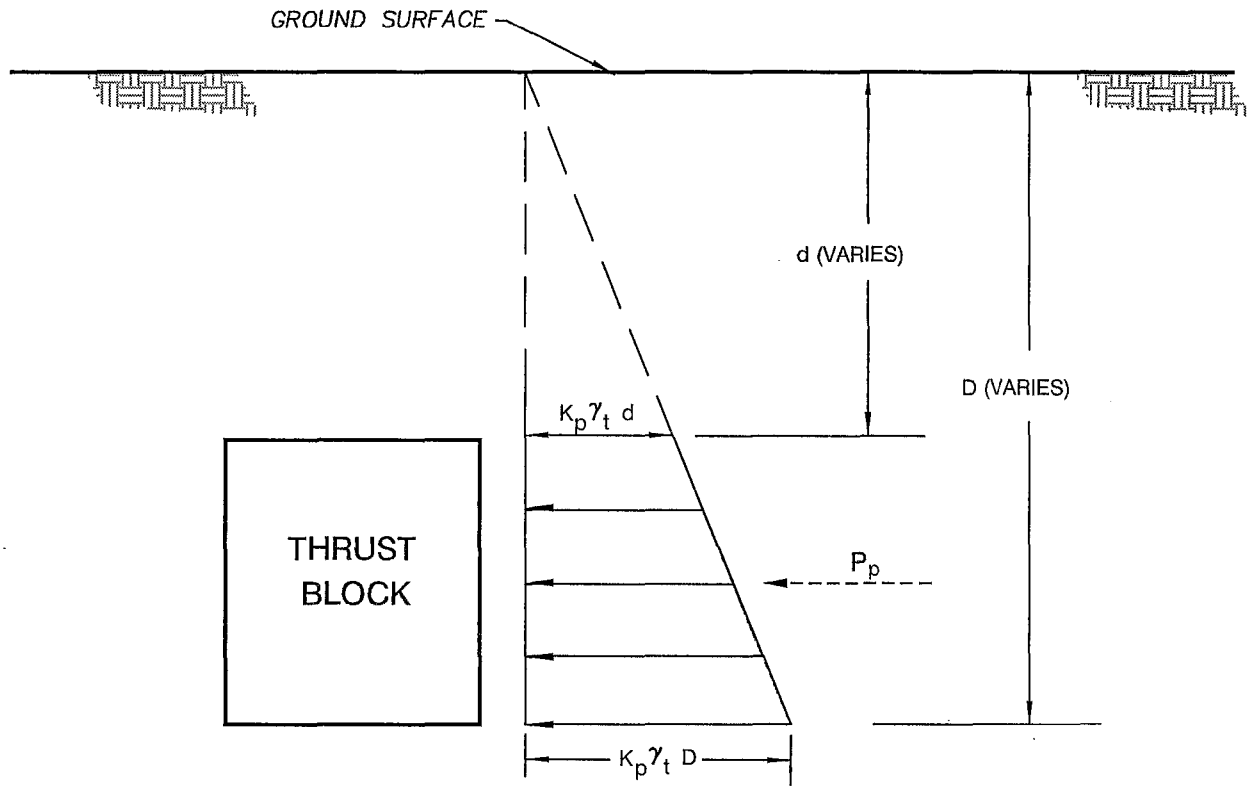
NOTES:

1. APPARENT LATERAL EARTH PRESSURE, P_a
   P_a = 24 H psf
2. CONSTRUCTION TRAFFIC INDUCED SURCHARGE PRESSURE, P_s
   P_s = 120 psf
3. PASSIVE LATERAL EARTH PRESSURE, P_p
   P_p = 350 D psf
4. ASSUMES GROUNDWATER IS NOT PRESENT
5. SURCHARGES FROM EXCAVATED SOIL OR CONSTRUCTION MATERIALS ARE NOT INCLUDED
6. H AND D ARE IN FEET

NOT TO SCALE

Ninyo & Moore		LATERAL EARTH PRESSURES FOR BRACED EXCAVATION (GRANULAR SOIL)	FIGURE
PROJECT NO.	DATE	FIRE STATION NO. 5 REPLACEMENT 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	6
107260001	3/12		

fig6 107260001 braced ex.dwg



NOTES:

1. GROUNDWATER BELOW BLOCK

   $P_p = 175\ (D^2-d^2)$ lb/ft

2. GROUNDWATER ABOVE BLOCK

   $P_p = 1.6\ (D-d)[124.8h + 58(D+d)]$ lb/ft

3. d AND D ARE IN FEET
4. ASSUMES BACKFILL IS GRANULAR MATERIAL
5. ASSUMES THRUST BLOCK IS ADJACENT TO COMPETENT MATERIAL

NOT TO SCALE

fig7 107260001 thrust.dwg

Ninyo & Moore		THRUST BLOCK LATERAL EARTH PRESSURE DIAGRAM	FIGURE
PROJECT NO.	DATE	FIRE STATION NO. 5 REPLACEMENT 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	7
107260001	3/12		

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

Field Procedure for the Collection of Relatively Undisturbed Samples

The Modified Split-Barrel drive sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a 140-pound hammer, in general accordance with ASTM D 3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0	■							Bulk sample.
		■						Modified split-barrel drive sampler.
		⊠						No recovery with modified split-barrel drive sampler.
		▬						Sample retained by others.
		◤						Standard Penetration Test (SPT).
5		◢						No recovery with a SPT.
		▯	XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
		◥						No recovery with Shelby tube sampler.
		▤						Continuous Push Sample.
				⚲				Seepage.
10				▽				Groundwater encountered during drilling.
				▼				Groundwater measured after drilling.
						▨	SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
						▨	CL	Dashed line denotes material change.
15						▨		Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
20								The total depth line is a solid line that is drawn at the bottom of the boring.

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BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE
	Rev. 11/11	

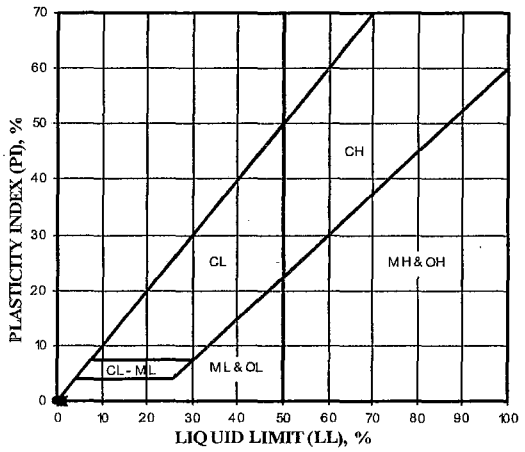
U.S.C.S. METHOD OF SOIL CLASSIFICATION

MAJOR DIVISIONS		SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (More than 1/2 of soil > No. 200 Sieve Size)	GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size	GW	Well graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction < No. 4 sieve size	SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (More than 1/2 of soil < No. 200 sieve size)	SILTS & CLAYS Liquid Limit <50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS Liquid Limit >50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils

GRAIN SIZE CHART

CLASSIFICATION	RANGE OF GRAIN	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	306 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.76
Coarse	3" to 3/4"	76.2 to 19.1
Fine	3/4" to No. 4	19.1 to 4.76
SAND	No. 4 to No. 200	4.76 to 0.075
Coarse	No. 4 to No. 10	4.76 to 2.00
Medium	No. 10 to No. 40	2.00 to 0.420
Fine	No. 40 to No. 200	0.420 to 0.075
SILT & CLAY	Below No. 200	Below 0.075

PLASTICITY CHART



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U.S.C.S. METHOD OF SOIL CLASSIFICATION

DATE DRILLED 2/8/12 BORING NO. B-1

GROUND ELEVATION 292' ± (MSL) SHEET 1 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Scott's Drilling) (CME-55)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY BTM LOGGED BY BTM REVIEWED BY RDH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 5 inches thick.
						SC	FILL: Brown, moist, medium dense, clayey SAND; scattered gravel and cobbles.
5		50/5"					VERY OLD PARALIC DEPOSITS: Reddish brown, damp to moist, moderately cemented, silty fine-grained SANDSTONE; scattered gravel and cobbles.
10		64	18.1	102.7			SAN DIEGO FORMATION: Light reddish brown, moist, weakly cemented, silty fine-grained SANDSTONE; scattered gravel and cobbles.
15		79					Light brownish gray to reddish brown, damp, weakly cemented, fine sandy SILTSTONE.
20		86					

Ninyo & Moore

BORING LOG

FIRE STATION NO. 5 REPLACEMENT, 3902 9TH AVENUE
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107260001	3/12	A-1

DATE DRILLED 2/8/12 BORING NO. B-1

GROUND ELEVATION 292' ± (MSL) SHEET 2 OF 2

METHOD OF DRILLING 8" Hollow-Stem Auger (Scott's Drilling) (CME-55)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY BTM LOGGED BY BTM REVIEWED BY RDH

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
20								Total Depth = 20 feet. No groundwater encountered. Backfilled with bentonite and black-dyed concrete cap shortly after drilling on 2/8/12. Note: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
25								
30								
35								
40								

Ninyo & Moore

BORING LOG

FIRE STATION NO. 5 REPLACEMENT, 3902 9TH AVENUE
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107260001	3/12	A-2

DATE DRILLED 2/8/12 BORING NO. B-2

GROUND ELEVATION 292' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 8" Hollow-Stem Auger (Scott's Drilling) (CME-55)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY BTM LOGGED BY BTM REVIEWED BY RDH

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							CL	FILL: Brown, moist, stiff, sandy CLAY; scattered gravel.
5			86/11"					VERY OLD PARALIC DEPOSITS: Reddish brown, damp to moist, moderately cemented, silty fine-grained SANDSTONE; scattered gravel and cobbles.
10			50/6"					SAN DIEGO FORMATION: Light reddish brown, damp, weakly cemented, silty fine-grained SANDSTONE; scattered gravel and cobbles. Auger refusal on cobbles.
15								Total Depth = 12 feet. No groundwater encountered. Backfilled with bentonite shortly after drilling on 2/8/12. Note: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
20								

Ninyo & Moore

BORING LOG

FIRE STATION NO. 5 REPLACEMENT, 3902 9TH AVENUE
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107260001	3/12	A-3

DATE DRILLED 2/8/12 BORING NO. B-3

GROUND ELEVATION 292' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 8" Hollow-Stem Auger (Scott's Drilling) (CME-55)

DRIVE WEIGHT 140 lbs. (Auto-Trip Hammer) DROP 30"

SAMPLED BY BTM LOGGED BY BTM REVIEWED BY RDH

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							SC	LANDSCAPE FILL: Brown, moist, medium dense, clayey SAND; scattered gravel.
								VERY OLD PARALIC DEPOSITS: Reddish brown, damp, weakly cemented, silty fine-grained SANDSTONE; scattered gravel and cobbles.
5			50/5"	9.0	103.4			
10			74/11"					SAN DIEGO FORMATION: Light reddish brown, damp, weakly cemented, silty fine-grained SANDSTONE; scattered gravel and cobbles. Auger refusal on cobbles.
								Total Depth = 12 feet. No groundwater encountered. Backfilled with bentonite shortly after drilling on 2/8/12. Note: Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
15								
20								

Ninyo & Moore

BORING LOG

FIRE STATION NO. 5 REPLACEMENT, 3902 9TH AVENUE
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107260001	3/12	A-4

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory borings were evaluated in general accordance with ASTM D 2937. The test results are presented on the logs of the exploratory borings in Appendix A.

Gradation Analysis

Gradation analysis test was performed on a selected representative soil sample in general accordance with ASTM D 422. The grain-size distribution curve is shown on Figures B-1. These test results were utilized in evaluating the soil classification in accordance with USCS.

Direct Shear Tests

Direct shear tests were performed on undisturbed samples in general accordance with ASTM D 3080 to evaluate the shear strength characteristics of the selected materials. The samples were inundated during shearing to represent adverse field conditions. The test results are shown on Figure B-2.

Expansion Index Tests

The expansion index of selected material was evaluated in general accordance with Uniform Building Code (UBC) Standard No. 18-2 (ASTM D 4829). A specimen was molded under a specified compactive energy at approximately 50 percent saturation (plus or minus 1 percent). The prepared 1-inch thick by 4-inch diameter specimen was loaded with a surcharge of 144 pounds per square foot and was inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The results of this test are presented on Figure B-3.

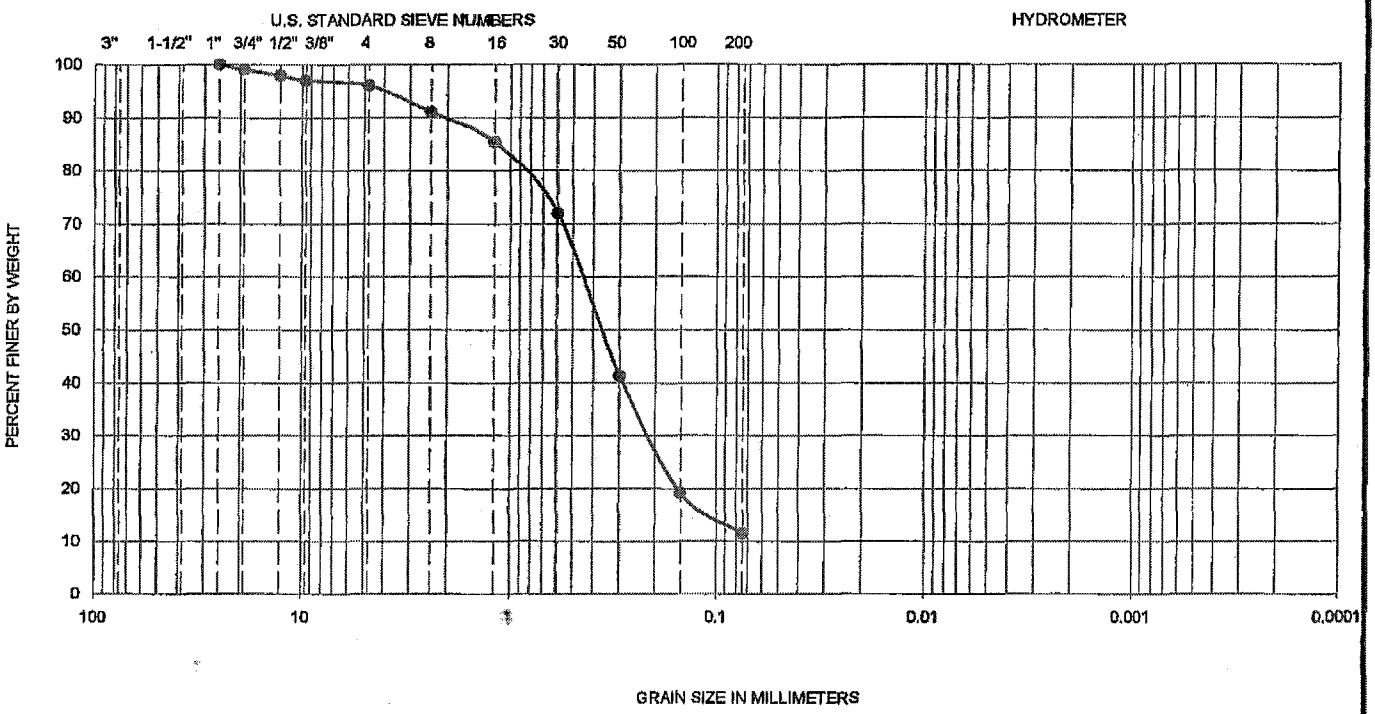
Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on a representative sample in general accordance with CT 643. The soluble sulfate and chloride content of the selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-4.

R-Value

The resistance value, or R-value, for site soils was evaluated in general accordance with CT 301. Sample was prepared and evaluated for exudation pressure and expansion pressure. The equilibrium R-value is reported as the lesser or more conservative of the two calculated results. The test results are shown on Figure B-5.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay

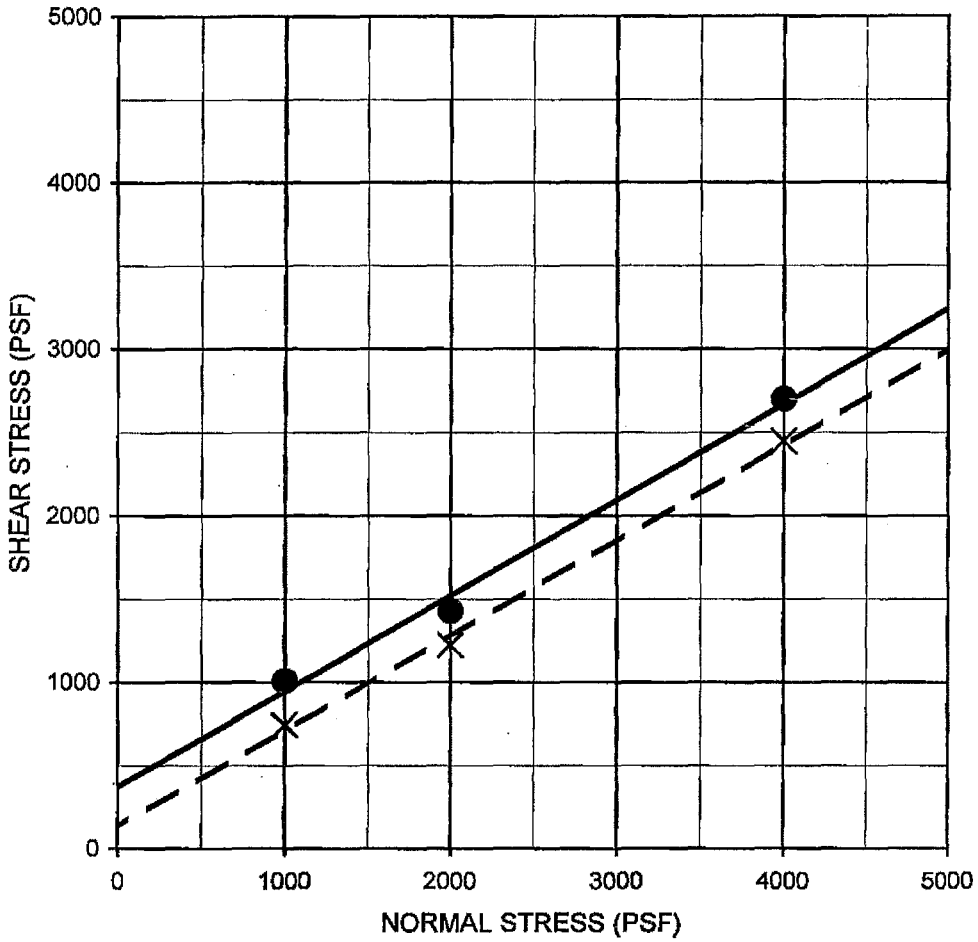


Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	U.S.C.S
●	B-1	0.5-2.9	--	--	--	--	--	--	--	--	12	SC

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore	GRADATION TEST RESULTS	FIGURE
PROJECT NO. / DATE	FIRE STATION NO.5 REPLACEMENT 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	B-1
107260001 / 3/12		

107260001_SIEVE B-1 @ 0.5-2.9.xls



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SANDSTONE	—●—	B-1	5.0-5.9	Peak	370	30	Formation
Silty SANDSTONE	- - X - -	B-1	5.0-5.9	Ultimate	130	30	Formation

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore	DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO. / DATE	FIRE STATION NO.5 REPLACEMENT 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	B-2
107260001 / 3/12		

107260001_DIRECT SHEAR B-1 @ 5.0-5.9.xls

SAMPLE LOCATION	SAMPLE DEPTH (FT)	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (PCF)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (IN)	EXPANSION INDEX	POTENTIAL EXPANSION
B-2	0.0-2.0	10.0	108.6	20.1	0.061	60	Medium

PERFORMED IN GENERAL ACCORDANCE WITH ☐ UBC STANDARD 18-2 ☑ ASTM D 4829

Ninyo & Moore	EXPANSION INDEX TEST RESULTS	FIGURE
PROJECT NO. / DATE	FIRE STATION NO.5 REPLACEMENT 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	B-3
107260001 / 3/12		

107260001_EXPANSION Page 1.xls

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-2	0.0-2.0	7.5	800	350	0.035	200

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore	CORROSIVITY TEST RESULTS	FIGURE
PROJECT NO. 107260001 / DATE 3/12	FIRE STATION NO.5 REPLACEMENT 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	B-4

107260001_CORROSIVITY Page 1.xls

SAMPLE LOCATION	SAMPLE DEPTH (FT)	SOIL TYPE	R-VALUE
B-2	0.0-2.0	Sandy CLAY (CL)	21

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2844/CT 301

Ninyo & Moore		R-VALUE TEST RESULTS	FIGURE
PROJECT NO.	DATE	FIRE STATION NO.5 REPLACEMENT 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	B-5
107260001	3/12		

107260001_R-Value TABLE page 1.xls

LIMITED GEOTECHNICAL EVALUATION
TEMPORARY FIRE STATION NO. 5
4311 3RD AVENUE
SAN DIEGO, CALIFORNIA

PREPARED FOR:
Rob Wellington Quigley Architects
416 13th Street, Suite 300
San Diego, California 92101

PREPARED BY:
Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

February 11, 2016
Project No. 107260004

February 11, 2016
Project No. 107260004

Mr. Bob Dickens
Rob Wellington Quigley Architects
416 13th Street, Suite 300
San Diego, California 92101

Subject: Limited Geotechnical Evaluation
Temporary Fire Station No. 5
4311 3rd Avenue
San Diego, California

Dear Mr. Dickens:

In accordance with your authorization, we have performed a limited geotechnical evaluation for the proposed Temporary Fire Station No. 5 in San Diego, California. This report presents our geotechnical findings, conclusions, and recommendations regarding the proposed project. We appreciate the opportunity to be of service.

Sincerely,
NINYO & MOORE

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Distribution: (1) Addressee (via e-mail)

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Appendices

Appendix A – Boring Logs
Appendix B – Laboratory Testing

1. INTRODUCTION

In accordance with your request, we have performed a limited geotechnical evaluation for the proposed Temporary Fire Station No. 5 project. The project site is located at 4311 3rd Avenue in the city of San Diego, California (Figure 1). This report presents the results of our field exploration and laboratory testing, our conclusions regarding the geotechnical conditions at the site, and our recommendations for the design and construction of this project. A geotechnical report for the permanent Fire Station No. 5 was previously submitted by us (Ninyo & Moore, 2012).

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included the following tasks:

- Reviewing background information including available geotechnical reports, topographic maps, geologic data, fault maps, aerial photographs, and provided site information.
- Performing a field reconnaissance to observe existing site conditions and to locate and mark proposed exploratory boring locations.
- Coordinating and mobilizing for the subsurface exploration. Mark-out of the existing underground utilities was performed through Underground Service Alert (USA).
- Performing a limited subsurface exploration that consisted of excavating, logging, and sampling two hand-excavated exploratory borings. Coring of the asphalt concrete (AC) pavement to provide access to our borings was performed at each location. Bulk soil samples were obtained at selected intervals from the borings. The collected samples were transported to our in-house geotechnical laboratory for analysis.
- Performing limited geotechnical laboratory testing on selected soil samples to evaluate soil parameters for design purposes.
- Compiling and analyzing the data obtained from our background review, subsurface exploration, and laboratory testing.
- Preparing this report presenting our findings, conclusions, and recommendations.

3. SITE AND PROJECT DESCRIPTION

The proposed temporary fire station site is located at the old San Diego Hospice property at the northern terminus of 3rd Avenue in the Hillcrest neighborhood of San Diego. The property is generally bounded by open space and canyons to the north, east, and west, and 3rd Avenue to the south. The site coordinates are approximately 32.7581°N latitude and -117.1641°W longitude. The site of the proposed temporary fire station is a relatively flat AC paved parking lot. The ground elevation is approximately 295 feet above mean sea level (MSL).

We understand that the proposed construction at the site includes a temporary sprung structure. The approximate location of the structure is shown on Figure 2. The structure is anticipated to be anchored to the pavement or ground using bolts or pins. The structure is anticipated to house a fire truck, a rescue vehicle, and a sports utility vehicle. The crew (fire fighters) will be housed in one of the existing adjacent buildings. We further understand that the existing pavement may be used for the proposed improvements or new pavements may be constructed.

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our limited subsurface exploration was conducted on January 14, 2016 and consisted of excavating, logging, and sampling of two manually-excavated exploratory borings (B-1 and B-2). The borings were excavated to approximate depths of up to 2.5 feet below existing grades, where refusal to further excavation was encountered. Bulk soil samples were obtained from the borings at selected intervals. The samples were then transported to our in-house geotechnical laboratory for testing. The approximate locations of the exploratory borings are shown on Figure 2. The boring logs are included in Appendix A.

Limited geotechnical laboratory testing of representative soil samples included in-situ moisture content, gradation, expansion index, R-value, and soil corrosivity. The results of the moisture content tests are presented on the boring logs in Appendix A. The results of the other laboratory tests performed are presented in Appendix B.

5. GEOLOGY AND SUBSURFACE CONDITIONS

Our findings regarding regional and site geology, groundwater conditions, faulting and seismicity, landslides, and other geologic hazards at the subject site are provided in the following sections. Figure 3, Figure 4, and Figure 5 are Geology, Fault Locations, and Geologic Hazards, respectively.

5.1. Regional and Geologic Setting

The project area is situated in the coastal foothill section of the Peninsular Ranges Geomorphic Province. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California (Norris and Webb, 1990; Harden, 1998). The province varies in width from approximately 30 to 100 miles. In general, the province consists of rugged mountains underlain by Jurassic metavolcanic and metasedimentary rocks, and Cretaceous igneous rocks of the southern California batholith. In the coastal portion of the province in San Diego County, the metamorphic and granitic basement rocks are overlain by sedimentary materials that are Tertiary and Quaternary in age.

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending approximately northwest. Several of these faults (Figure 4) are considered active faults. The Elsinore, San Jacinto, and San Andreas faults are active fault systems located northeast of the project area and the Rose Canyon, Coronado Bank, Newport-Inglewood, and San Clemente faults are active faults located west of the project area. The Rose Canyon Fault Zone, the nearest active fault system, has been mapped approximately 1.5 miles west of the project site. Major tectonic activity associated with these and other faults within this regional tectonic framework consists primarily of right-lateral, strike-slip movement. The approximate fault-to-site distance was calculated by the United States Geological Survey (2008) National Seismic Hazard Maps database (web-based). Further discussion of faulting relative to the site is provided in the Faulting and Seismicity section of this report.

5.2. Site Geology

Geologic units observed during our site reconnaissance, subsurface exploration, and mapped at the site include fill, very old paralic deposits, and the Mission Valley Formation (Kennedy and Tan, 2008). Generalized descriptions of the units anticipated at the site are provided below. The geology of the site vicinity is shown on Figure 3.

5.2.1. Fill

Undocumented fill materials were encountered to the total depth of our borings beneath the pavement section to depths of approximately 2.5 feet below existing grades, where refusal to further excavation was encountered. These materials were observed to generally consist of various shades of brown, moist, medium dense to dense, silty sand with clay and clayey gravel with sand, and stiff to very stiff, sandy clay with gravel. Scattered cobbles were encountered in the fill materials. Documentation of the placement and compaction of existing fill was not available for our review.

5.2.2. Very Old Paralic Deposits ($Qvop_8$)

Although not encountered during our subsurface exploration, Quaternary-age very old paralic deposits, formerly referred to as the Lindavista Formation, are anticipated to exist below the fill and are mapped at the site (Kennedy and Tan, 2008). Per the reviewed mapping, these materials consist of weakly to strongly cemented, silty and clayey sandstone with gravel and cobbles.

5.2.3. Mission Valley Formation (Tmv)

Although not encountered during our subsurface exploration, materials of the middle Eocene-aged Mission Valley Formation are mapped as underlying the very old paralic deposits. Per the reviewed mapping and our experience in the project area, these materials consist of predominantly light olive-gray, soft and friable, fine- to medium-grained marine and non-marine sandstone containing cobble conglomerate tongues (Kennedy and Tan, 2008).

5.3. Groundwater

Groundwater was not encountered during our subsurface evaluation. Based on our review of previous reports in the project area (Ninyo & Moore, 2012b), groundwater is anticipated to be deeper than 50 feet below the ground surface. Perched zones and fluctuations in the groundwater level may occur due to variations in ground surface topography, subsurface geologic conditions and structure, rainfall, irrigation, and other factors.

6. GEOLOGIC HAZARDS

In general, geologic hazards include ground surface rupture, strong ground motion, liquefaction, tsunamis, landsliding, and flooding. These considerations are discussed in the following sections.

6.1. Faulting and Seismicity

Based on our review of the referenced geologic maps and stereoscopic aerial photographs, as well as on our geologic field mapping, the subject site is not underlain by known active or potentially active faults (i.e., faults that exhibit evidence of ground displacement in the last 11,000 years and 2,000,000 years, respectively). However, the site is located in a seismically active area, as is the majority of southern California, and the potential for strong ground motion is considered significant during the design life of the proposed structure.

The nearest known active fault is the Rose Canyon fault, located approximately 1.5 miles west of the site. It is noted that the Florida Canyon fault, which is not considered active by the State of California, is mapped approximately 1.5 miles east of the project site (Figure 5). While not considered active, this fault has been designated as a potentially active fault (i.e., a fault that exhibits evidence of ground displacement in the last 2,000,000 years).

In general, hazards associated with seismic activity include strong ground motion, ground rupture, liquefaction, seismically induced settlement, and tsunamis. These hazards are discussed in the following sections.

6.1.1. Ground Motion

The 2013 California Building Code (CBC) specifies that the Risk-Targeted, Maximum Considered Earthquake (MCE_R) ground motion response accelerations be used to evaluate seismic loads for design of buildings and other structures. The MCE_R ground motion response accelerations are based on the spectral response accelerations for 5 percent damping in the direction of maximum horizontal response and incorporate a target risk for structural collapse equivalent to 1 percent in 50 years with deterministic limits for near-source effects. The horizontal peak ground acceleration (PGA) that corresponds to the MCE_R for the site was calculated as 0.49g using the United States Geological Survey (USGS, 2013) seismic design tool (web-based). Spectral response acceleration parameters, consistent with the 2013 CBC, are also provided in the recommendations section of this report for the evaluation of seismic loads on buildings and other structures.

The 2013 CBC specifies that the potential for liquefaction and soil strength loss be evaluated, where applicable, for the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration with adjustment for site class effects in accordance with the American Society of Civil Engineers (ASCE) 7-10 Standard. The MCE_G peak ground acceleration is based on the geometric mean peak ground acceleration with a 2 percent probability of exceedance in 50 years. The MCE_G peak ground acceleration with adjustment for site class effects (PGA_M) was calculated as 0.53g using the USGS (USGS, 2013) seismic design tool that yielded a mapped MCE_G peak ground acceleration of 0.53g for the site and a site coefficient (F_{PGA}) of 1.0 for Site Class D.

6.1.2. Surface Ground Rupture

Based on our review of the referenced literature and our site reconnaissance, no active faults are known to cross the project site. Therefore, the probability of damage from surface fault rupture is considered to be low. However, lurching or cracking of the ground surface as a result of nearby seismic events is possible.

6.1.3. Liquefaction and Seismically Induced Settlement

Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Research and historical data indicate that loose granular soils and non-plastic silts that are saturated by a relatively shallow groundwater table are more susceptible to liquefaction. Based on the anticipated dense nature of the underlying very old paralic deposits and Mission Valley Formation, and the absence of a shallow groundwater table, it is our opinion that liquefaction and seismically induced settlement at the subject site are not design considerations.

6.1.4. Tsunamis

Tsunamis are long wavelength seismic sea waves (long compared to the ocean depth) generated by sudden movements of the ocean bottom during submarine earthquakes, landslides, or volcanic activity. Based on the inland location and elevation of the site, the potential for a tsunami to affect the site is not a design consideration.

6.2. Landsliding

Landslides may be induced by strong vibratory motion produced by earthquakes. The process for zoning earthquake-induced landslides incorporates expected future earthquake shaking, existing landslide features, slope gradient, and strength of earth materials on the slope. The project area is mapped in an area considered generally susceptible to landslides with low to moderate risk for seismically induced landslides (Tan, 1995; City of San Diego, 2008). Based on our review of the relevant geologic maps, aerial photographs, and our site reconnaissance, landslides were not mapped or observed underlying or adjacent to the site.

6.3. Flood Hazards

Based on our review of Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), the project site is located outside of the mapped 100-year flood zone. Therefore, flooding is not a design consideration for the project.

6.4. City of San Diego Seismic Safety Study

According to the City of San Diego Seismic Safety Study (2008), the project site lies within Hazard Category 53 (Figure 5). Hazard Category 53 is characterized by areas of level or sloping terrain with unfavorable geologic structure that possess low to moderate risk.

7. CONCLUSIONS

Based on our review of the referenced background data, subsurface exploration and laboratory testing, it is our opinion that construction of the proposed temporary fire station and improvements is feasible from a geotechnical standpoint provided that the recommendations of this report are incorporated into the design and construction of the project. In general, the following conclusions were made:

- The site is underlain by fill soils, very old paralic deposits, and the Mission Valley Formation.
- Groundwater was not encountered during our subsurface exploration. Perched conditions or fluctuations in the groundwater level may occur due to variations in ground surface topography, subsurface geologic conditions and structure, rainfall, irrigation, and other factors.
- The site is not located within a State of California Earthquake Fault (Alquist-Priolo Special Studies) Zone.
- The active Rose Canyon fault zone is located approximately 1.5 miles west of the site. Accordingly, the potential for relatively strong seismic ground motions should be considered in the project design.
- Landslides have not been mapped on or adjacent to the site.
- The site is not located in an area considered susceptible to liquefaction, tsunami, or flood hazards.
- The existing fill soils encountered on the site should be generally excavatable with heavy-duty earth moving equipment in good working condition. Gravel and cobbles were encountered in our borings. Additional efforts during excavation including heavy ripping should be anticipated in gravel and cobbles and formational materials. Additional processing and handling of materials including screening and crushing should also be anticipated.

- As discussed in Section 8.4 of this report, the existing pavement sections are not adequate for long term usage and will experience significant decrease in service life if used for fire truck traffic and other heavy traffic. Additionally, distress and cracking of the pavement should be anticipated and the potential exists that the pavement may have to be replaced during the temporary housing of the fire equipment.
- Based on the results of our soil corrosivity tests, ACI 318, and Caltrans (2012) criteria, the on-site soils would be classified as corrosive.

8. RECOMMENDATIONS

Based on our understanding of the project, the following recommendations are provided for the design and construction of the proposed temporary fire station improvements. The proposed site improvements should be constructed in accordance with the requirements of the applicable governing agencies. We understand that the pad preparation and foundation design for the temporary sprung structure will be provided by the contractor. If new pavements are constructed, the following earthwork recommendations should be used.

8.1. Earthwork

In general, earthwork should be performed in accordance with the recommendations presented in this report. Ninyo & Moore should be contacted for questions regarding the recommendations or guidelines presented herein.

8.1.1. Site Preparation

Site preparation should begin with the removal of structures, vegetation, utility lines, asphalt, concrete, and other deleterious debris from areas to be graded. Tree stumps and roots should be removed to such a depth that organic material is generally not present. Clearing and grubbing should extend to the outside of the proposed excavation and fill areas. The debris and unsuitable material generated during clearing and grubbing should be removed from areas to be graded and disposed of at a legal dumpsite away from the project area.

8.1.2. Excavation Characteristics

The existing fill soils encountered on the site should be generally excavatable with heavy-duty earth moving equipment in good working condition. Gravel and cobbles were encountered in our borings. Additional efforts during excavation including heavy ripping should be anticipated in gravel and cobbles and formational materials. Additional processing and handling of materials including screening and crushing should also be anticipated.

8.1.3. Materials for Fill

In general, fill material should not contain rocks or lumps over approximately 4 inches in diameter, and not more than approximately 30 percent larger than ¾ inch. Fill material should be free of trash, construction debris, roots, vegetation, or other deleterious materials.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of offsite.

Imported fill material, if needed for the project, should generally be granular soils with a low expansion potential (i.e., an expansion index [EI] of 50 or less as evaluated by ASTM International [ASTM] Test Method D 4829). Import material should also be non-corrosive in accordance with ACI-318 and the Caltrans (2012) corrosion guidelines. Materials for use as fill should be evaluated by Ninyo & Moore's representative prior to importing.

8.1.4. Compacted Fill

Prior to placement of compacted fill, the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified to a depth of approximately 8 inches and moisture conditioned by wetting or aeration to generally near the optimum moisture

content. The scarified materials should then be compacted to 90 percent of their modified Proctor density as evaluated by ASTM D 1557. The evaluation of compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify this office and the appropriate governing agency when project areas are ready for observation, and to provide reasonable time for that review.

Fill materials should be moisture conditioned to generally near the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve a moisture content generally near the laboratory optimum, mixed, and then compacted by mechanical methods to 90 percent of its modified Proctor density as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved. The upper 12 inches of the subgrade materials beneath pavements and aggregate base should be compacted to 95 percent of its modified Proctor density as evaluated by ASTM D 1557.

8.2. Corrosion

Laboratory testing was performed on a representative sample of the on-site earth materials to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with California Test (CT) 643 and the sulfate and chloride content tests were performed in accordance with CT 417 and

CT 422, respectively. These laboratory test results are presented in Appendix B. Import materials should be tested in the same manner, as noted in Section 7.1.4 of this report.

The results of the corrosivity testing indicated an electrical resistivity of 670 ohm-cm, a soil pH of 7.0, a chloride content of 155 parts per million (ppm) and a sulfate content of 0.060 percent (i.e., 600 ppm). Based on the Caltrans corrosion (2012) criteria, ACI 318, and our experience, the on-site soils would be classified as corrosive. Corrosive soils are defined as the soils with electrical resistivities less than 1,000 ohm-cm, more than 500 ppm chlorides, more than 0.1 percent sulfates, or a pH less than 5.5.

8.3. Seismic Design Considerations

Design of the proposed improvements should be performed in accordance with the requirements of governing jurisdictions and applicable building codes. Table 1 presents the seismic design parameters for the site in accordance with the CBC (2013) guidelines and adjusted MCE_R spectral response acceleration parameters (USGS, 2013).

Table 1 – 2013 California Building Code Seismic Design Criteria

Site Coefficients and Spectral Response Acceleration Parameters	Values
Site Class	D
Site Coefficient, F_a	1.025
Site Coefficient, F_v	1.543
Mapped Spectral Response Acceleration at 0.2-second Period, S_s	1.186 g
Mapped Spectral Response Acceleration at 1.0-second Period, S_1	0.457 g
Spectral Response Acceleration at 0.2-second Period Adjusted for Site Class, S_{MS}	1.216 g
Spectral Response Acceleration at 1.0-second Period Adjusted for Site Class, S_{M1}	0.705 g
Design Spectral Response Acceleration at 0.2-second Period, S_{DS}	0.811 g
Design Spectral Response Acceleration at 1.0-second Period, S_{D1}	0.470 g

8.4. Flexible Pavement Design

Laboratory R-value testing of on-site soils resulted in an R-value of 13. Based on the R-value of 13 and the thickness of the pavement section encountered in our borings, we have estimated (back calculated) the Traffic Index (TI) that the existing pavement was designed for as shown in Table 2.

Table 2 – Existing Pavement Section

R-Value	Asphalt Concrete (in)	Class 2 Aggregate Base (in)	Estimated Traffic Index (TI)
13	3.0	6.5	4.5

As noted, we understand that the existing pavement may be used for the proposed improvements or new pavements may be constructed. The existing pavement sections are not adequate for long term usage and will experience significant decrease in service life if used for fire truck traffic and other heavy traffic. Additionally, distress and cracking of the pavement should be anticipated and the potential exists that the pavement may have to be replaced during the temporary housing of the fire equipment.

If new pavements are constructed for the proposed temporary fire station, the following recommendations should be used. Our preliminary flexible pavement design is based on the R-value of 13. Actual pavement recommendations should be based on R-value tests performed on bulk samples of the soils that are exposed at the finished subgrade elevations across the site at the completion of the mass grading operations. As noted, we understand that the traffic in the project area will consist of a fire truck and other automobiles and light trucks. For preliminary design we have assumed TI of 6.0, 7.0, and 8.0 for flexible pavements. If TI is different, the pavement section should be re-evaluated. The preliminary recommended pavement sections are presented in Table 3.

Table 3 – Recommended Preliminary Pavement Sections

Traffic Index	R-Value	Asphalt Concrete (in)	Class 2 Aggregate Base (in)
6.0	13	4.0	10.0
7.0	13	5.0	11.5
8.0	13	5.5	14.5

We recommend that the upper 12 inches of the subgrade and base materials be compacted to a relative compaction of 95 percent relative density as evaluated by the current version of ASTM D 1557.

8.5. Rigid Pavement Design

If the project designer intends to use rigid pavements due to fire truck and potential trash truck traffic, we recommend that the upper 12 inches of the subgrade be compacted to a relative compaction of 95 percent of the laboratory Proctor density as evaluated by ASTM D 1557. We recommend that for these rigid pavements, 8 inches of 600-psi flexural strength Portland cement concrete reinforced with No. 4 bars each way, be used. For rigid pavements where fire truck and trash truck traffic is not anticipated, we recommend the concrete be 4 inches in thickness and reinforced with No. 4 bars each way. We recommend that we re-evaluate the pavement design, based on the subgrade material exposed at the time of construction. The pavement reinforcement and expansion joint spacing should be designed by the project designer.

8.6. Drainage

Drainage improvements, including the slope of the pavement surface, subsurface drain lines and swales, should be provided and maintained to convey surface water runoff away from pavement surfaces. Surface water should not pond over the pavements.

8.7. Plan Review and Construction Observation

The conclusions and recommendations presented in this report are based on our review of the referenced background data and our field and laboratory evaluation. If conditions are found to vary from those described in this report, Ninyo & Moore should be notified, and additional recommendations will be provided upon request. Ninyo & Moore should review the final project drawings and specifications prior to the commencement of construction. Ninyo & Moore should perform the needed observation and testing services during construction operations.

The recommendations provided in this report are based on the assumption that Ninyo & Moore will provide geotechnical observation and testing services during construction. In the event that it is decided not to utilize the services of Ninyo & Moore during construction, we request that the selected consultant provide the client with a letter (with a copy to Ninyo & Moore) indicating that they fully understand Ninyo & Moore's recommendations, and that they are in full agreement with the design parameters and recommendations contained in

this report. Construction of proposed improvements should be performed by qualified sub-contractors utilizing appropriate techniques and construction materials.

9. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of

natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no controls.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

10. REFERENCES

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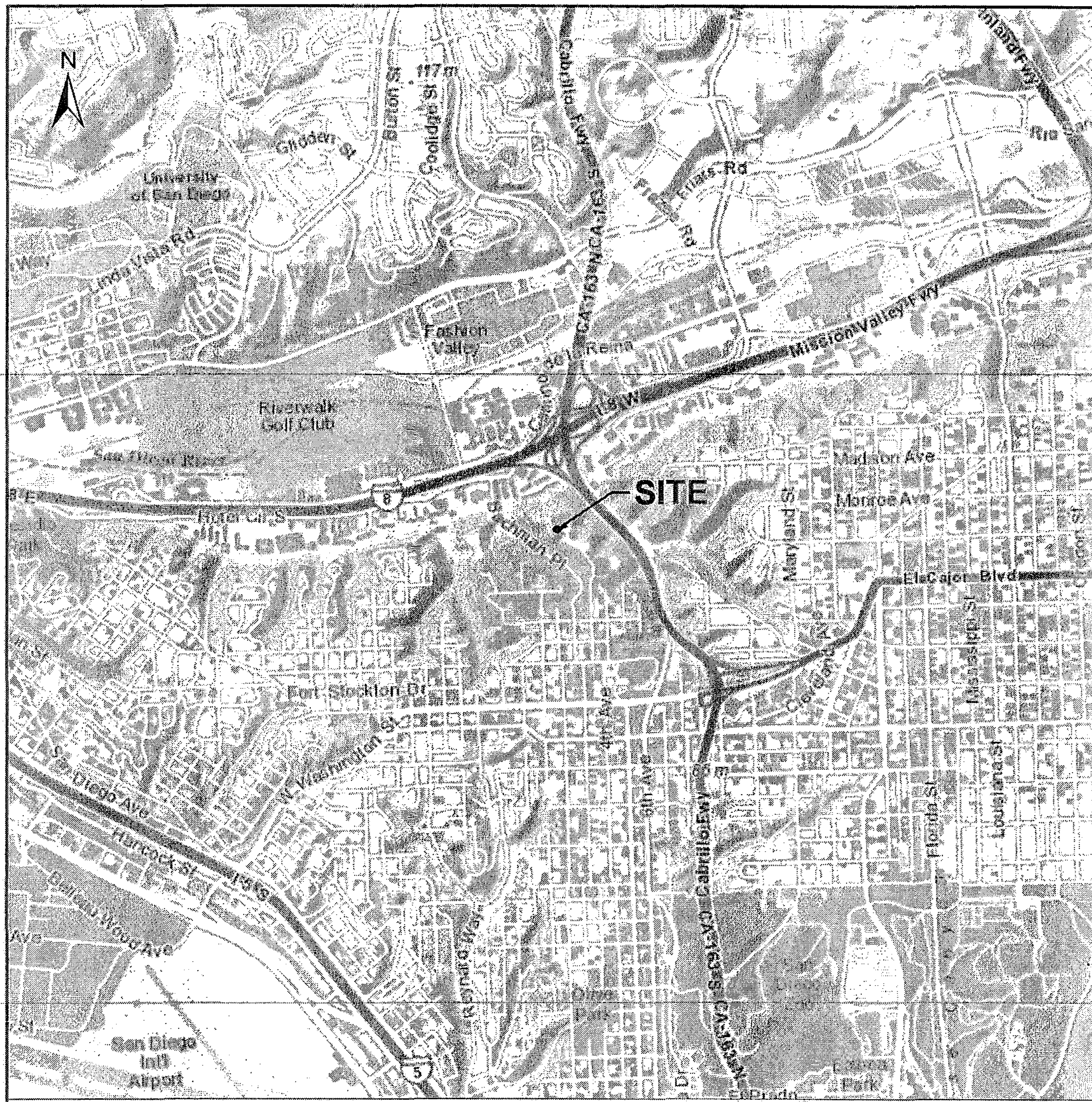
AERIAL PHOTOGRAPHS				
Source	**Date**	**Flight**	**Numbers**	**Scale**
USDA	March 31, 1953	AXN-3M	193 and 198	1:20,000



SCALE IN FEET

0 1,200 2,400 4,800

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		SITE LOCATION	FIGURE
PROJECT NO.	DATE	TEMPORARY FIRE STATION NO. 5 4311 3RD AVENUE SAN DIEGO, CALIFORNIA	1
107260004	2/16		

107260004_SL_S3.mxd AOB

SOURCE: GOOGLE EARTH, 2016.

LEGEND

B-2 (TD=2.3) BORING
TD=TOTAL DEPTH IN FEET

N

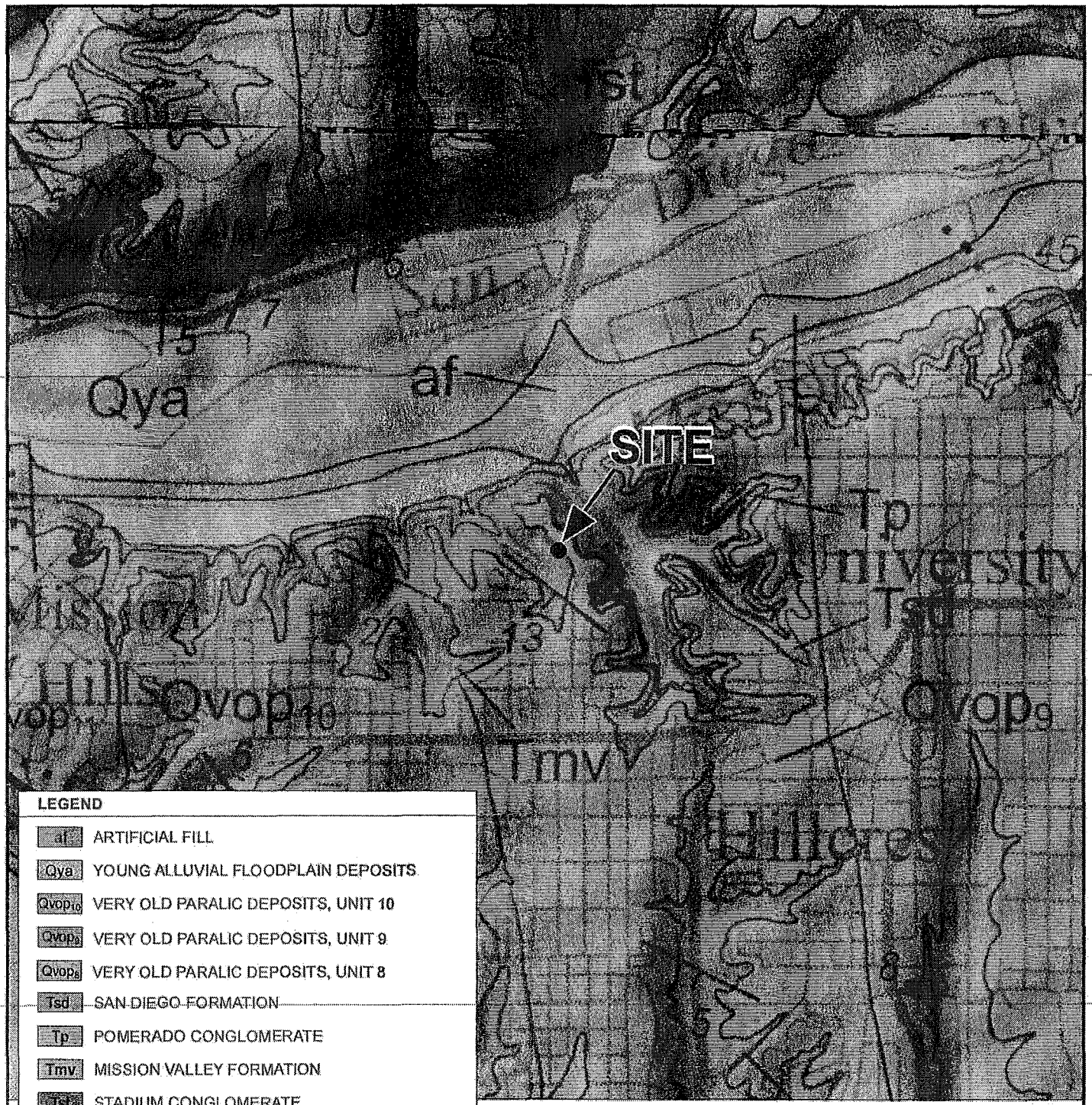
SCALE IN FEET

0 20 40 80

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore	BORING LOCATIONS	FIGURE
PROJECT NO. 107260004 / DATE 2/16	TEMPORARY FIRE STATION NO. 5 4311 3RD AVENUE SAN DIEGO, CALIFORNIA	2

2_107260004_BL_S3.mxd AOB



SOURCE: KENNEDY, M.P., AND TAN, S.S., 2008, GEOLOGIC MAP OF THE SAN DIEGO 30' X 60' QUADRANGLE, CALIFORNIA

LEGEND

- af — ARTIFICIAL FILL
- Qya — YOUNG ALLUVIAL FLOODPLAIN DEPOSITS
- $Qvop_{10}$ — VERY OLD PARALIC DEPOSITS, UNIT 10
- $Qvop_9$ — VERY OLD PARALIC DEPOSITS, UNIT 9
- $Qvop_8$ — VERY OLD PARALIC DEPOSITS, UNIT 8
- Tsd — SAN DIEGO FORMATION
- Tp — POMERADO CONGLOMERATE
- Tmv — MISSION VALLEY FORMATION
- Tst — STADIUM CONGLOMERATE
- U/D — FAULT - SOLID WHERE ACCURATELY LOCATED, DASHED WHERE APPROXIMATE, DOTTED WHERE CONCEALED. ARROW AND NUMBER INDICATE DIRECTION AND ANGLE OF DIP OF FAULT PLANE
- 5 — STRIKE AND DIP OF BEDS, INCLINED
- Qls? — LANDSLIDE - ARROWS INDICATE PRINCIPAL DIRECTION OF MOVEMENT, QUERIED WHERE EXISTENCE IS QUESTIONABLE

NOTES: ALL DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

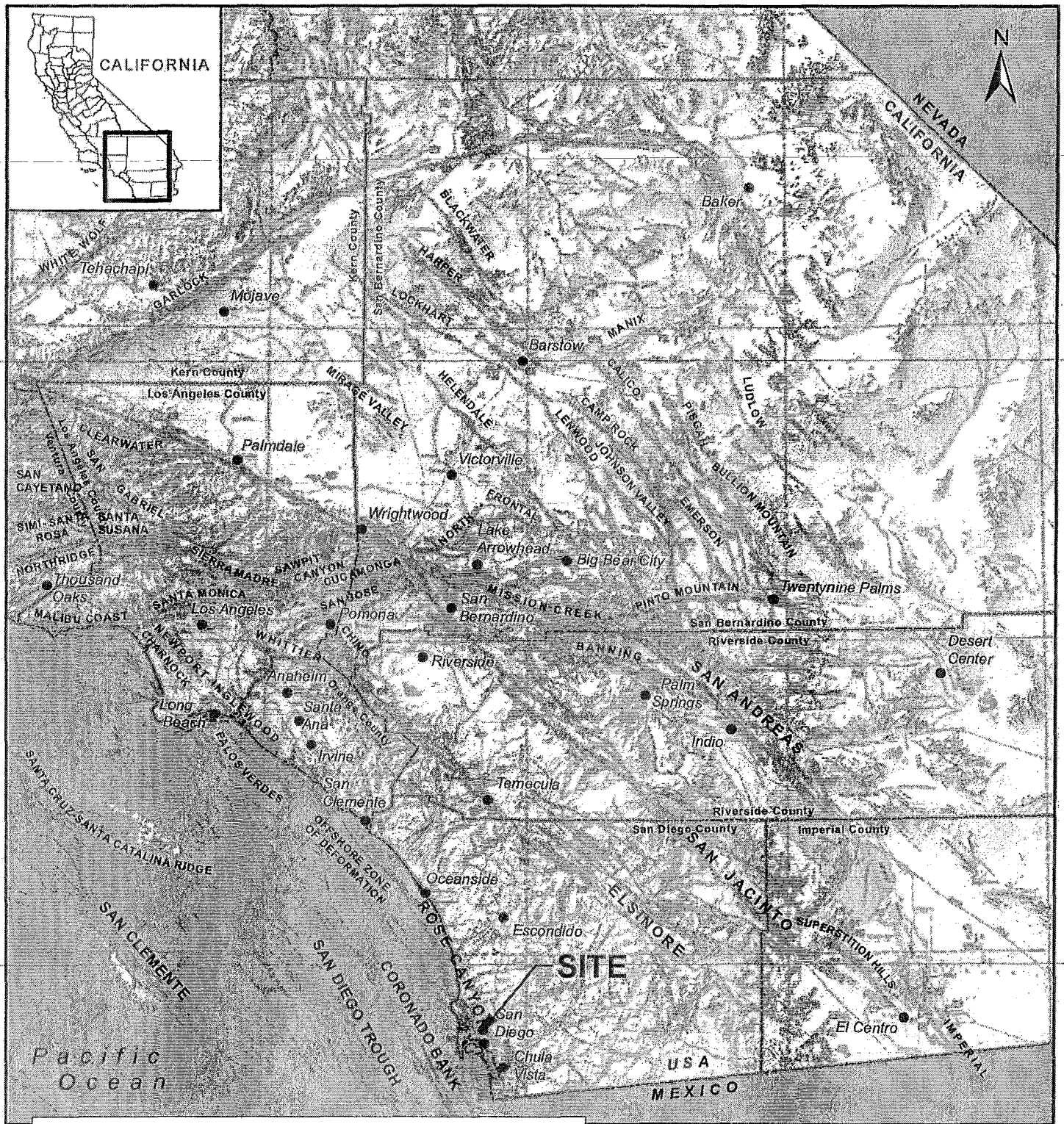
N

SCALE IN FEET

0 2,000 4,000 FEET

3_107260004_G_35.mxd AOB

Ninyo & Moore	GEOLOGY	FIGURE
PROJECT NO. 107260004 / DATE 2/16	TEMPORARY FIRE STATION NO. 5 4311 3RD AVENUE SAN DIEGO, CALIFORNIA	3



LEGEND

CALIFORNIA FAULT ACTIVITY

- HISTORICALLY ACTIVE
- HOLOCENE ACTIVE
- LATE QUATERNARY (POTENTIALLY ACTIVE)
- QUATERNARY (POTENTIALLY ACTIVE)
- STATE/COUNTY BOUNDARY

SOURCE: JENNINGS, C.W., AND BRYANT, W.A., 2010, FAULT ACTIVITY MAP OF CALIFORNIA, CALIFORNIA GEOLOGICAL SURVEY.

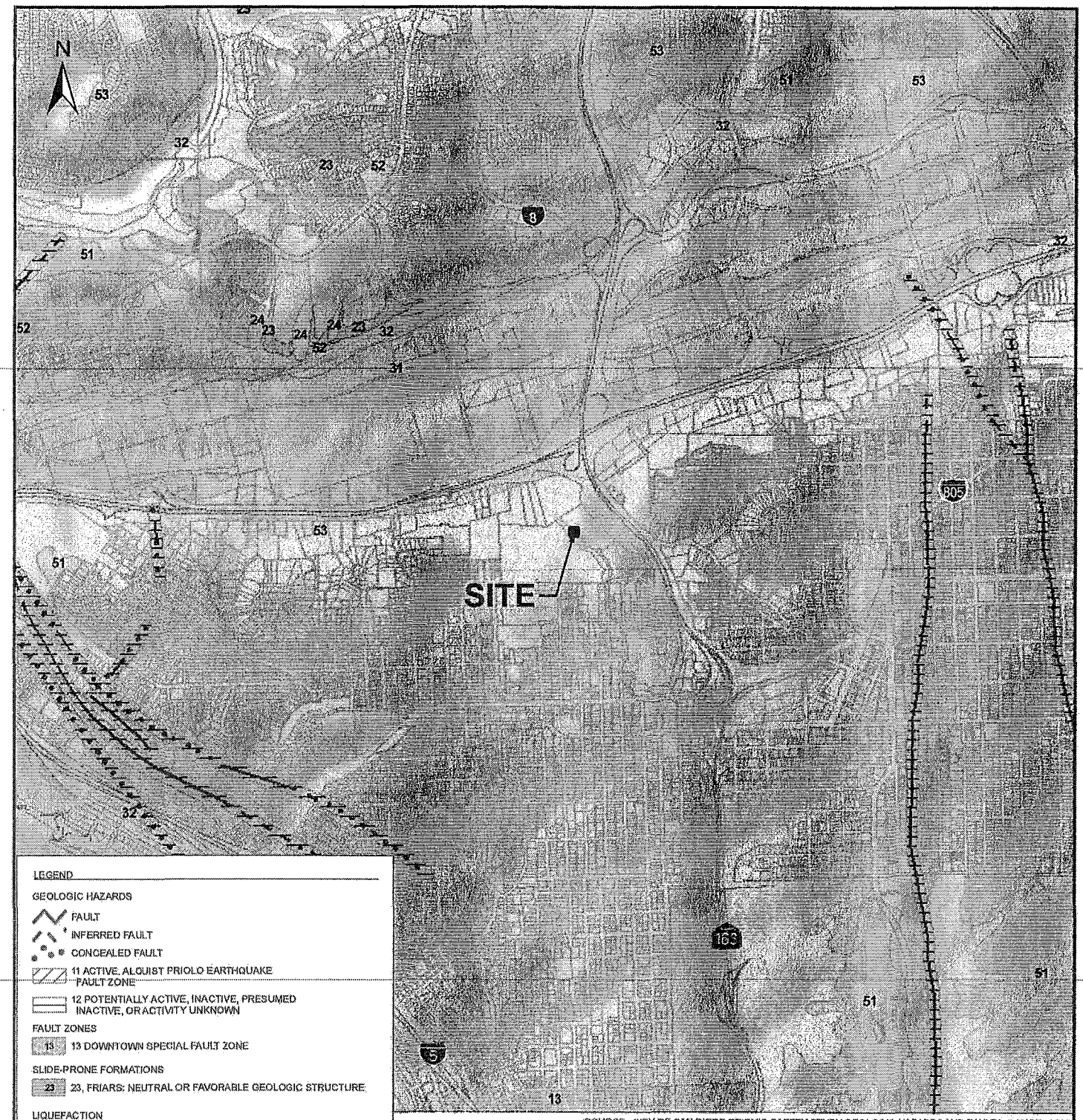
SCALE IN MILES

0 30 60

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	FAULT LOCATIONS	FIGURE
PROJECT NO. 107260004 / DATE 2/16	TEMPORARY FIRE STATION NO. 5 4311 3RD AVENUE SAN DIEGO, CALIFORNIA	4

107260004_E_93.mxd ACB



SOURCE: CITY OF SAN DIEGO SEISMIC SAFETY STUDY GEOLOGIC HAZARDS AND FAULTS, SANGIS, 2008

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	GEOLOGIC HAZARDS	FIGURE
PROJECT NO. 107260004 / DATE 2/16	TEMPORARY FIRE STATION NO. 5 4311 3RD AVENUE SAN DIEGO, CALIFORNIA	5

J:\107260004_GH_93.mxd AOB

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using bulk samples. Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0	■							Bulk sample.
		■						Modified split-barrel drive sampler.
		⊠						2-inch inner diameter split-barrel drive sampler.
		⊠						No recovery with modified split-barrel drive sampler, or 2-inch inner diameter split-barrel drive sampler.
		▬						Sample retained by others.
5		◥						Standard Penetration Test (SPT).
		╱						No recovery with a SPT.
		▭	XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
		╱						No recovery with Shelby tube sampler.
		▤						Continuous Push Sample.
10				♀				Seepage.
				▽				Groundwater encountered during drilling.
				▼				Groundwater measured after drilling.
						▨	SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
						▨	CL	Dashed line denotes material change.
						▨		Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
15						▨		
						▨		
						▨		
						▨		
						▨		
						▨		
						▨		
						▨		
						▨		
20						▨		The total depth line is a solid line that is drawn at the bottom of the boring.

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BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE

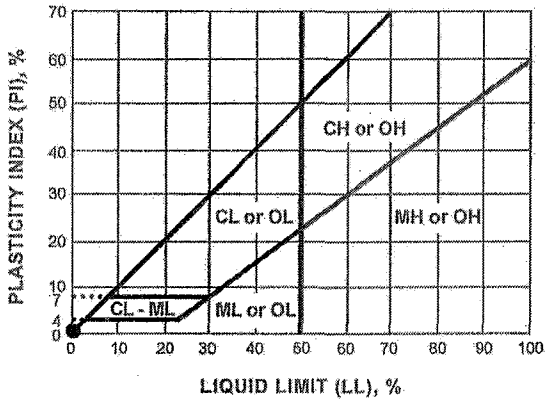
SOIL CLASSIFICATION CHART PER ASTM D 2488

PRIMARY DIVISIONS			SECONDARY DIVISIONS	
			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	GRAVEL more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	SILT and CLAY liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above "A"-line)	organic CLAY
			OH (plots below "A"-line)	organic SILT
	Highly Organic Soils		PT	Peat

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than basketball-sized
Cobbles		3 - 12"	3 - 12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb-sized to fist-sized
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029"	Flour-sized and smaller

PLASTICITY CHART



APPARENT DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPOOLING CABLE OR CATHEAD		AUTOMATIC TRIP HAMMER	
	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)	SPT (blows/foot)	MODIFIED SPLIT BARREL (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

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USCS METHOD OF SOIL CLASSIFICATION

Explanation of USCS Method of Soil Classification

PROJECT NO.	DATE	FIGURE

DATE DRILLED 1/14/16 BORING NO. B-1

GROUND ELEVATION 295' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING Coring Machine and Hand Tools

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY CKV LOGGED BY CKV REVIEWED BY RDH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0						GW	ASPHALT CONCRETE: Approximately 3-1/4 inches thick.
						CL	BASE: Approximately 6-1/2 inches thick.
			7.1			SM	FILL: Brown, moist, stiff to very stiff, sandy CLAY with gravel; scattered cobbles up to approximately 5 inches in diameter and organics.
							Light brown, moist, medium dense, silty SAND with clay and gravel; scattered cobbles. Refusal on gravel and cobbles.
5							Total Depth = 2.5 feet. (Refusal) Groundwater not encountered during excavation. Backfilled and patched with black-dyed rapid-set concrete shortly after excavation on 1/14/16.
10							Note: Groundwater, though not encountered at the time of excavation, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
15							The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
20							

Ninyo & Moore

BORING LOG

TEMPORARY FIRE STATION NO. 5, 4311 3RD AVENUE
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
1	1/16	A-1

DATE DRILLED 1/14/16 BORING NO. B-2

GROUND ELEVATION 295' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING Coring Machine and Hand Tools

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY CKV LOGGED BY CKV REVIEWED BY RDH

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 2-3/4 to 3 inches thick.
						GW	
			6.2			GC	BASE: Approximately 6-1/2 inches thick.
							FILL: Brown, moist, medium dense to dense, clayey GRAVEL with sand; scattered cobbles up to approximately 5 inches in diameter and organics.
							Refusal on gravel and cobbles.
5							Total Depth = 2.3 feet. (Refusal)
							Groundwater not encountered during excavation.
							Backfilled and patched with black-dyed rapid-set concrete shortly after excavation on 1/14/16.
10							Note: Groundwater, though not encountered at the time of excavation, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
							The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
15							
20							

Ninyo & Moore

BORING LOG

TEMPORARY FIRE STATION NO. 5, 4311 3RD AVENUE
SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
	1/16	A-2

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of the exploratory excavations in Appendix A.

Moisture Content

The moisture content of samples obtained from the exploratory excavations was evaluated in accordance with ASTM D 2216. The test results are presented on the logs of the exploratory excavations in Appendix A.

Gradation Analysis

A gradation analysis test was performed on a selected representative soil sample in general accordance with ASTM D 422. The grain-size distribution curve is shown on Figure B-1. These test results were utilized in evaluating the soil classifications in accordance with USCS.

Expansion Index Tests

The expansion index of a selected material was evaluated in general accordance with Uniform Building Code (UBC) Standard No. 18-2 (ASTM D 4829). A specimen was molded under a specified compactive energy at approximately 50 percent saturation. The prepared 1-inch thick by 4-inch diameter specimen was loaded with a surcharge of 144 pounds per square foot and was inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The results of this test are presented on Figure B-2.

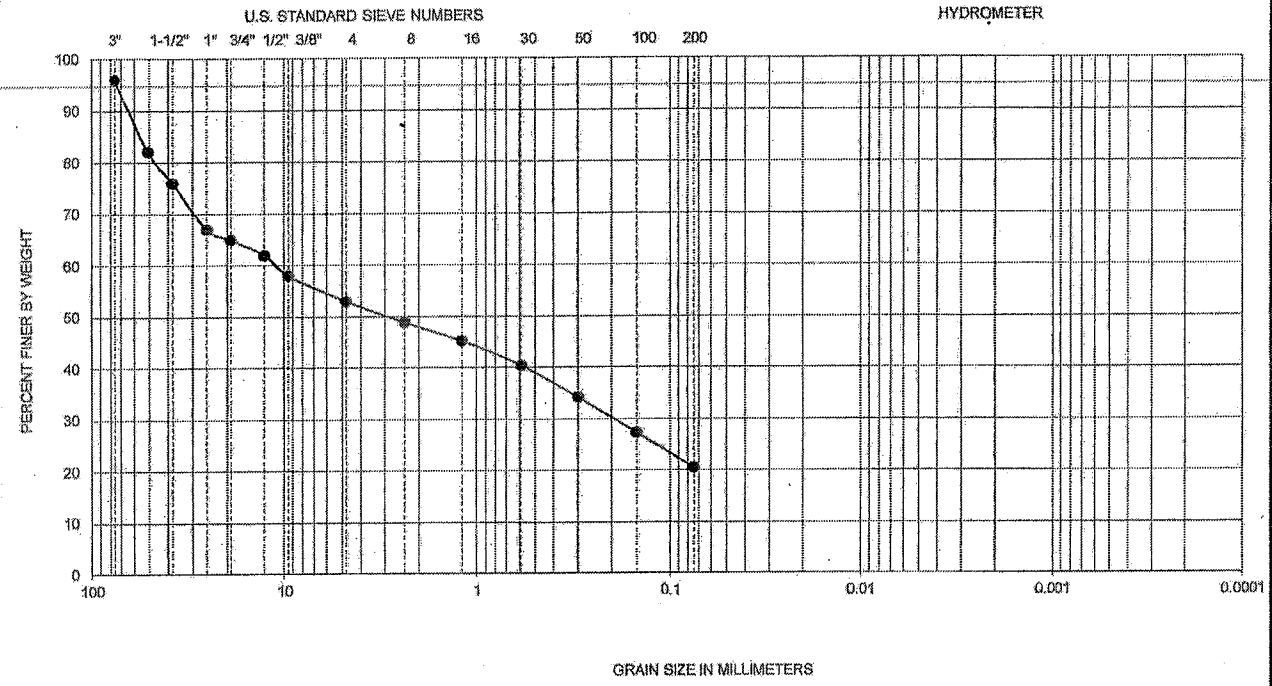
Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on a representative sample in general accordance with California Test (CT) 643. The soluble sulfate and chloride content of the selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-3.

R-Value

The resistance value, or R-value, for site soils was evaluated in general accordance with CT 301. A sample was prepared and evaluated for exudation pressure and expansion pressure. The equilibrium R-value is reported as the lesser or more conservative of the two calculated results. The test results are shown on Figure B-4.

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-2	0.8-2.3	--	--	--	--	--	--	--	--	20	GC

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore		GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	TEMPORARY FIRE STATION NO. 5 4311 3RD AVENUE SAN DIEGO, CALIFORNIA	B-1
107260004	2/16		

107260004_SIEVE B-2 @ 0.8-2.3.xls

SAMPLE LOCATION	SAMPLE DEPTH (FT)	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (PCF)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (IN)	EXPANSION INDEX	POTENTIAL EXPANSION
B-2	0.8-2.3	10.0	109.1	20.6	0.043	42	Low

PERFORMED IN GENERAL ACCORDANCE WITH ☐ UBC STANDARD 18-2 ☑ ASTM D 4829

Ninyo & Moore		EXPANSION INDEX TEST RESULTS	FIGURE
PROJECT NO.	DATE	TEMPORARY FIRE STATION NO. 5 4311 3RD AVENUE SAN DIEGO, CALIFORNIA	B-2
107260004	2/16		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-2	0.8-2.3	7.0	670	600	0.060	155

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore	CORROSIVITY TEST RESULTS	FIGURE
PROJECT NO. / DATE	TEMPORARY FIRE STATION NO. 5 4311 3RD AVENUE SAN DIEGO, CALIFORNIA	B-3
107260004 / 2/16		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	SOIL TYPE	R-VALUE
B-2	0.8-2.3	Clayey GRAVEL (GC)	13

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2844/CT 301

Ninyo & Moore		R-VALUE TEST RESULTS	FIGURE
PROJECT NO.	DATE	TEMPORARY FIRE STATION NO. 5 4311 3RD AVENUE SAN DIEGO, CALIFORNIA	B-4
107260004	2/16		

SUPPLEMENTAL
GEOTECHNICAL EVALUATION
FIRE STATION NO. 5 ALLEY IMPROVEMENTS
3902 9TH AVENUE
SAN DIEGO, CALIFORNIA

PREPARED FOR:
Rob Wellington Quigley Architects
416 13th Street
San Diego, California 92101

PREPARED BY:
Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
5710 Ruffin Road
San Diego, California 92123

May 28, 2013
Project No. 107260002

May 28, 2013
Project No. 107260002

Mr. Bob Dickens
Rob Wellington Quigley Architects
416 13th Street
San Diego, California 92101

Subject: Supplemental Geotechnical Evaluation
Fire Station No. 5 Alley Improvements
3902 9th Avenue
San Diego, California

Dear Mr. Dickens:

In accordance with your authorization and our Proposal dated March 29, 2013, Ninyo & Moore has performed a supplemental geotechnical evaluation for the Fire Station No. 5 alley improvements between 8th and 9th Avenues in San Diego, California. The purpose of this study was to evaluate soil conditions at the site and to provide geotechnical recommendations regarding the planned improvements. This report presents our findings, conclusions, and recommendations regarding the geotechnical aspects of the proposed improvements.

We appreciate the opportunity to be of service on this project.

Sincerely,
NINYO & MOORE

Madan Chirumalla, PE
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
MADAN CHIRUMALLA, PE
No. 74186
Exp. 6/30/13
CIVIL
STATE OF CALIFORNIA

Kenneth H. Mansir, PE, GE
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. MANSIR, JR.
No. 2739
EXP. 06/30/14
GEOTECHNICAL
STATE OF CALIFORNIA

MAC/KHM/gg

Distribution: (1) Addressee

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Appendix A – Boring Logs
Appendix B – Laboratory Testing

1. INTRODUCTION

Ninyo & Moore previously submitted a geotechnical evaluation report for the Fire Station No. 5 replacement project, dated March 2, 2012. In accordance with your request and authorization, we have performed a supplemental geotechnical evaluation of the soil conditions for the pavement improvements in the alley between 8th and 9th Avenues in San Diego, California. The project location is shown on Figure 1. The purpose of our geotechnical services was to evaluate the near-surface soil conditions at the site and to prepare recommendations for the design and construction of the proposed improvements. This report presents our findings, conclusions, and recommendations based on our subsurface evaluation, laboratory testing, and geotechnical analyses.

2. SCOPE OF SERVICES

Our geotechnical services during this evaluation were performed in general accordance with our proposal dated March 29, 2013, and consisted of the following:

- Reviewing readily available background information and geotechnical report for Fire Station No. 5 (Ninyo & Moore, 2012).
- Preparing and submitting a traffic control plan to the City of San Diego and obtaining an encroachment permit for our field evaluation.
- Providing traffic control services for our field evaluation.
- Performing three cores to measure the thickness of the existing pavement and provide access for the performance of our borings.
- Performing a subsurface exploration consisting of three exploratory borings to depths of about 4 feet below the ground surface to evaluate the near-surface soil conditions underlying the site. The borings were performed using hand auger equipment, and collected soil samples were transported to our in-house geotechnical laboratory for testing.
- Performing geotechnical laboratory testing of representative soil samples to evaluate in-situ moisture content, corrosivity, and R-Value.
- Perform data compilation and engineering analysis to evaluate the geotechnical design criteria for the proposed improvements.
- Prepare this report presenting our findings along with our conclusions regarding the soil conditions at the site and geotechnical recommendations pertinent to the planned improvements.

3. SITE DESCRIPTION

Fire Station No. 5 site is located at 3902 9th Avenue in the Hillcrest community of the City of San Diego, California (Figure 1). The alley is located between the 8th and 9th Avenues (Figure 2). The alley is a single-lane, two-way street that runs in a general east-west direction. The alley is paved with Portland cement concrete (PCC) in the western portion and asphalt concrete (AC) in the central and eastern portions. The existing AC pavement exhibited moderate distress and the PCC pavement exhibited severe distress in the form of longitudinal and transverse cracks and alligator cracking at several locations along the alignment. Topographically, the site is level with a surface elevation of about 295 feet above the mean sea level (MSL).

4. PROPOSED CONSTRUCTION

We understand the fire trucks would use the alley to access the fire station from the 8th Avenue. Based on the condition of the existing pavements and the current City Standard Drawings (2012), recommendations for demolishing and replacing the existing PCC and AC pavements with new PCC pavement are presented in the following sections. Minor grading is anticipated during replacement of the existing pavements.

5. SUBSURFACE EVALUATION AND LABORATORY TESTING

Our subsurface exploration was conducted on May 1, 2013. The subsurface exploration consisted of coring, logging, and hand sampling three, small-diameter exploratory borings to a depth of approximately 4 feet below the existing ground surface. The approximate locations of the exploratory borings are shown on Figure 2. The purpose of the exploratory borings was to observe the subsurface materials and to collect bulk soil samples for laboratory testing. Representative samples were transported to our in-house geotechnical laboratory for testing. Logs of the exploratory borings are presented in Appendix A.

Geotechnical laboratory testing was performed on representative soil samples to evaluate the in-situ moisture content, corrosivity, and R-value. The results of the moisture content tests are presented on the boring logs in Appendix A. The corrosivity and R-value test results are presented in Appendix B.

6. SUBSURFACE CONDITIONS

Aggregate base (AB) materials were encountered below the AC and PCC pavement and generally consisted of brown to dark brown, medium dense to very dense, silty gravel with sand. Fill materials were encountered below the aggregate base materials and generally consisted of brown to dark brown, damp to moist, firm to stiff, sandy clay and clay, with scattered gravel and cobbles. Very old paralic deposits were encountered below the fill in Borings B-1 and B-2 at a depth of approximately 2 feet and 2.5 feet below the ground surface, respectively, to the depth explored. As encountered, the very old paralic deposits generally consisted of reddish brown, damp to moist, moderately cemented, fine-grained sandstone, with clay and scattered gravel. Descriptions of the subsurface conditions are presented on the boring logs in Appendix A. Documentation regarding the placement of the fill and aggregate base materials were not available for our review. The following table presents a summary of the pavement sections encountered.

Table 1 – Encountered Pavement Sections

Boring No.	Encountered AC/ PCC Thickness (in)	Encountered AB Thickness (in)
B-1	4½ (AC)	7½
B-2	6½ (AC)	15½
B-3	7 (PCC)	10½

Groundwater was not encountered in our borings to the depths explored (up to about 4 feet), but seepage was encountered in Boring B-3. Groundwater was also not encountered in previous borings (Ninyo & Moore, 2012) to a depth of up to 20 feet. However, due to seasonal variation, irrigation and other factors, groundwater and or perched water conditions may occur within the project area.

7. CONCLUSIONS

Based on our background review, subsurface and geotechnical laboratory evaluation, it is our opinion that construction of the proposed improvements is feasible from a geotechnical standpoint provided that the recommendations presented in this report are incorporated into the design and construction. In general, the following conclusions were made.

- The existing AC pavement exhibited moderate distress and the PCC pavement exhibited severe distress in the form of longitudinal and transverse cracks and alligator cracking at several locations along the alignment. Based on the condition of the existing pavements and the current City Standard Drawings (2012), recommendations for demolishing and replacing the existing PCC and AC pavements with new PCC pavement are presented in the following sections.

- Fill materials and very old paralic deposits underlie the project site. Fill materials encountered below the aggregate base materials generally consisted of sandy clay and clay, with scattered gravel and cobbles. Very old paralic deposits consisting of sandstone were encountered below the fill in Borings B-1 and B-2 at a depth of approximately 2 feet and 2.5 feet below ground surface, respectively, to the depth explored. These materials generally consisted of sandstone, with clay and scattered gravel.

- Existing aggregate base materials derived from on-site excavations are generally considered suitable for reuse as fill materials. Due to the expansive nature of the clayey subgrade soils, they should be removed within the City of San Diego Right-of-Way in accordance with the City of San Diego Whitebook (2012). The extent and the depth of removal are discussed in the following sections.

- Based on our borings, the on-site earth materials should be generally excavatable with heavy-duty earthmoving equipment in good working condition. However, if cobbles or cemented zones are encountered, additional effort may be needed during excavation.

- Groundwater was not encountered in our borings to the depths explored (up to about 4 feet), but seepage was encountered in Boring B-3. However, due to seasonal variation, irrigation and other factors, groundwater and or perched water conditions may occur within the project area.

- Based on laboratory corrosion testing, the near-surface site soils are classified as corrosive in accordance with Caltrans (2012) guidelines, ACI 318, and our experience.

8. RECOMMENDATIONS

The geotechnical recommendations relative to the design and construction of the proposed improvements are presented in the following paragraphs.

8.1. Earthwork

Earthwork at the site is anticipated to consist of minor cuts and fills during grading for the alley. Earthwork should be performed in accordance with the requirements of applicable governing agencies, and the recommendations presented in the following sections.

8.1.1. Pre-Construction Meeting

We recommend that a preconstruction meeting be held. The owner and/or their representative, the governing agencies' representatives, the civil engineer, Ninyo & Moore, and the contractor should be in attendance to discuss the work plan and project schedule.

8.1.2. Site Preparation

Prior to performing site excavations, the surface areas should be cleared of existing pavements, vegetation, surface obstructions, and other deleterious materials. Pavements, vegetation, and debris from the clearing operations should be disposed of off-site. Obstructions that extend below the finished grade, if any, should be removed and the resulting holes filled with compacted fill.

8.1.3. Excavatability

Based on our borings, the on-site earth materials should be generally excavatable with heavy-duty earthmoving equipment in good working condition. However, if cobbles or cemented zones are encountered, additional effort may be needed during excavation.

8.1.4. Subgrade Preparation and Remedial Grading

Our laboratory testing (Ninyo & Moore, 2012) indicated the clayey fill soils have a moderate potential for expansion with an expansion index of 60. Moderately expansive clayey subgrade soils within the City of San Diego Right-of-Way should be removed to a depth of approximately 18-inches in accordance with the City of San Diego Whitebook (2012). The overexcavation should extend laterally a horizontal distance of 18-inches beyond the pavement limits, where feasible. Deeper removals of the subgrade soils to competent soil may be required and our offices should be contacted at the time of grading to evaluate the removals.

After the excavations are made, the exposed subgrade soils should be scarified to a depth of 8 inches or more, brought to near the optimum moisture content, and compacted to 90 percent of their maximum dry density as evaluated by ASTM International (ASTM) Test Method D 1557 (except for the upper 12 inches of the subgrade soils be-

neath pavement areas). Additionally, the compacted subgrade should be firm and unyielding. Materials in the upper 12 inches beneath the pavement section should be compacted to 95 percent of their maximum dry density as evaluated by ASTM D 1557.

8.1.5. Materials for Fill

In general, the existing aggregate base material is suitable for reuse as fill. Fill material should be free of trash, debris or other deleterious materials. Material for use as fill should not contain rocks or lumps greater than approximately 4 inches in size.

Utility trench backfill material should not contain rocks or lumps over approximately 3 inches in general. Soils classified as silts or clays should not be used for backfill in the pipe zone. Larger chunks, if generated during excavation, may be broken into acceptably sized pieces or disposed of off site.

Imported fill material, if used, should generally be granular soils with a very low expansion potential (i.e., an expansion index [EI] of 50 or less evaluated in accordance ASTM D 4829. Import material should also be non-corrosive in accordance with the Caltrans (2012) corrosion guidelines. Ninyo & Moore should evaluate materials for use as fill prior to filling or importing.

8.1.6. Compacted Fill

Prior to placement of compacted fill the contractor should request an evaluation of the exposed ground surface by Ninyo & Moore. Unless otherwise recommended, the exposed ground surface should then be scarified to a depth of approximately 8 inches and watered or dried, as needed, to achieve generally consistent moisture contents generally above the laboratory optimum. The scarified materials should then be compacted to 90 percent relative compaction in accordance with ASTM D 1557. The evaluation of compaction by the geotechnical consultant should not be considered to preclude any requirements for observation or approval by governing agencies. It is the contractor's responsibility to notify the geotechnical consultant and the appropriate governing agency when project areas are ready for observation, and to provide reasonable time for that review.

Fill materials conforming to our recommendations for Materials for Fill, should be moisture conditioned to generally above the laboratory optimum moisture content prior to placement. The optimum moisture content will vary with material type and other factors. Moisture conditioning of fill soils should be generally consistent within the soil mass.

Prior to placement of additional compacted fill material following a delay in the grading operations, the exposed surface of previously compacted fill should be prepared to receive fill. Preparation may include scarification, moisture conditioning, and recompaction.

Compacted fill should be placed in horizontal lifts of approximately 8 inches in loose thickness. Prior to compaction, each lift should be watered or dried as needed to achieve near optimum moisture condition, mixed, and then compacted by mechanical methods to a relative compaction of 90 percent as evaluated by ASTM D 1557. The upper 12 inches of pavement subgrade should be compacted by mechanical methods to 95 percent as evaluated by ASTM D 1557. Successive lifts should be treated in a like manner until the desired finished grades are achieved.

8.1.7. Drainage

Positive surface gradients should be provided. Positive drainage is defined as a slope of 2 percent or more over a distance of 5 feet or greater. Surface water should not be allowed to pond within the area of the proposed pavements.

8.2. Rigid Pavement Design

Based on the City of San Diego Standard Drawing SDG-113, Pavement Design Standards Schedule "J", PCC pavement shall be constructed in alleys. The pavement shall be Class 560-B-3250 concrete with a minimum modulus of rupture of 600 psi.

Laboratory testing of onsite soil material indicates an R-value of 10. We understand that traffic will consist primarily of automobiles, light trucks, trash trucks, and fire trucks. For preliminary design we have assumed Traffic Indices (TI) of 7.0, 8.0, and 9.0 for site pavements. The preliminary pavement sections are presented in Table 2.

Table 2 – Preliminary Rigid Pavement Sections

Traffic Index	Portland Cement Concrete (inches)	Cement Treated Base (inches)
7.0	7.5	--
8.0	8.0	--
9.0	8.0	5.0

As noted, the upper 12 inches of the subgrade and base materials be compacted to a relative compaction of 95 or more percent relative density as evaluated by the current version of ASTM D 1557. We further recommend that Ninyo & Moore re-evaluate the pavement design based on actual TI values of the pavement areas and the subgrade material exposed at the time of construction.

8.3. Corrosion

Laboratory testing was performed on a representative sample of the on-site earth materials to evaluate pH and electrical resistivity, as well as chloride and sulfate contents. The pH and electrical resistivity tests were performed in accordance with California Test (CT) 643 and the sulfate and chloride content tests were performed in accordance with CT 417 and CT 422, respectively. These laboratory test results are presented in Appendix B.

The results of the corrosivity testing indicated an electrical resistivity of 830 ohm-cm, a soil pH of 9.4, a chloride content of 80 parts per million (ppm) and a sulfate content of 0.078 percent (i.e., 780 ppm). Based on the Caltrans corrosion (2012) criteria, ACI 318, and our experience the on-site soils would be classified as corrosive. Corrosive soils are defined as the soils with electrical resistivities less than 1,000 ohm-cm, more than 500 ppm chlorides, more than 0.1 percent sulfates, or a pH less than 5.5.

8.4. Concrete

Concrete in contact with soil or water that contains high concentrations of water-soluble sulfates can be subject to premature chemical and/or physical deterioration. As stated above, the soil sample tested in this evaluation indicated a water-soluble sulfate content of 0.078 percent by weight (i.e., about 780 ppm). According to the American Concrete Institute (ACI) 318, the potential for sulfate attack is negligible for water-soluble sulfate content of up to about 0.10 percent by weight (i.e., 1,000 ppm) in soils. Therefore, the site soils may be considered to have a negligible potential for sulfate attack. However, due to the potential variability of site soils, we recommend using Type II/V cement and/or incorporating fly-ash into the concrete mix as well as maintaining a water to cement ratio of 0.45.

9. CONSTRUCTION OBSERVATION

The recommendations provided in this report are based on our understanding of the proposed project and our evaluation of the data based on subsurface conditions observed in widely spaced exploratory borings. The interpolated subsurface conditions should be checked by Ninyo & Moore during construction. Observation and testing of compacted fill should also be performed by our office during site grading. We further recommend that the project plans and specifications be reviewed by this office prior to construction. It should be noted that, upon review of these documents, some recommendations presented in this report may be revised or modified.

During construction we recommend that our duties include, but not be limited to:

- Observing clearing, grubbing, and removal of unsuitable materials.
- Observing excavation, placement, and compaction of engineered fill.
- Evaluating imported materials (if used) prior to their use as fill.
- Performing field tests to evaluate fill compaction.

The recommendations provided in this report assume that Ninyo & Moore will be retained as the geotechnical consultant during the construction phase of this project. If another geotechnical consultant is selected, we request that the selected consultant indicate to our firm in writing that our recommendations are understood and that they are in full agreement with our recommendations.

10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No other warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified, and additional recommendations, if warranted, will be provided upon request. In the event of any changes in the nature, design, or locations of the proposed improvements, the conclusions and recommendations presented herein may not be valid unless the changes are evaluated by Ninyo & Moore and the conclusions of this report are modified in writing. It should be understood that the conditions of a site may change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

11. REFERENCES

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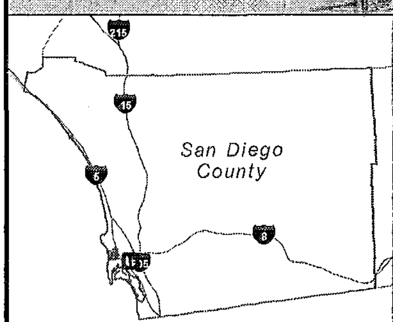

MAP INDEX

SCALE IN FEET

0 1,200 2,400 4,800

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore		SITE LOCATION	FIGURE
PROJECT NO.	DATE	FIRE STATION NO. 5 ALLEY IMPROVEMENTS 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	1
107260002	5/13		

107260002_SL.mxd AOB

SOURCE: AERIAL IMAGERY - PHOTO DATE: FEB 11, 2010, ESRI, I-CUBED, USDA FSA, USGS, AEX, GEOEYE, GETMAPPING, AEROGRID, IGP.

LEGEND

B-3 TD=4.0' BORING TD=TOTAL DEPTH IN FEET

SITE BOUNDARY

N

SCALE IN FEET

0 25 50 100

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE

Ninyo & Moore	BORING LOCATIONS	FIGURE
PROJECT NO. 107260002 / DATE 5/13	FIRE STATION NO. 5 ALLEY IMPROVEMENTS 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	2

107260002_BL.mxd AGB

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET

DEPTH (feet)	SAMPLES: Bulk	SAMPLES: Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	
0	■							Bulk sample.
		■						Modified split-barrel drive sampler.
		⊠						No recovery with modified split-barrel drive sampler.
		▮						Sample retained by others.
		◤						Standard Penetration Test (SPT).
5		╱						No recovery with a SPT.
		▯	XX/XX					Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.
		╲						No recovery with Shelby tube sampler.
		▯						Continuous Push Sample.
				♀				Seepage.
10				▽				Groundwater encountered during drilling.
				▼				Groundwater measured after drilling.
						▨	SM	MAJOR MATERIAL TYPE (SOIL): Solid line denotes unit change.
						▨	CL	Dashed line denotes material change.
15						▨		Attitudes: Strike/Dip b: Bedding c: Contact j: Joint f: Fracture F: Fault cs: Clay Seam s: Shear bss: Basal Slide Surface sf: Shear Fracture sz: Shear Zone sbs: Shear Bedding Surface
						▨		The total depth line is a solid line that is drawn at the bottom of the boring.
20								

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BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE
	Rev. 11/11	

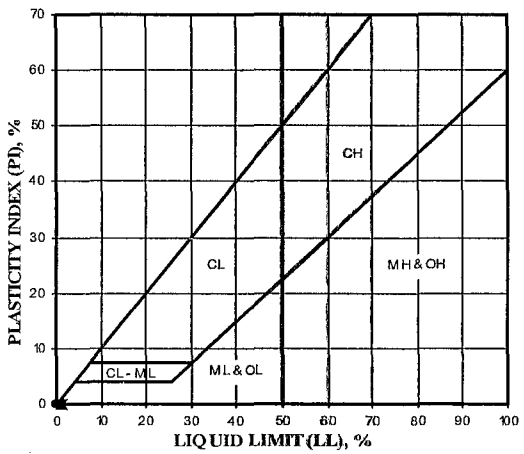
U.S.C.S. METHOD OF SOIL CLASSIFICATION

MAJOR DIVISIONS		SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (More than 1/2 of soil > No. 200 Sieve Size)	GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size	GW	Well graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction < No. 4 sieve size	SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (More than 1/2 of soil < No. 200 sieve size)	SILTS & CLAYS Liquid Limit <50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS Liquid Limit >50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils

GRAIN SIZE CHART

CLASSIFICATION	RANGE OF GRAIN	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	306 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.76
Coarse	3" to 3/4"	76.2 to 19.1
Fine	3/4" to No. 4	19.1 to 4.76
SAND	No. 4 to No. 200	4.76 to 0.075
Coarse	No. 4 to No. 10	4.76 to 2.00
Medium	No. 10 to No. 40	2.00 to 0.420
Fine	No. 40 to No. 200	0.420 to 0.075
SILT & CLAY	Below No. 200	Below 0.075

PLASTICITY CHART



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U.S.C.S. METHOD OF SOIL CLASSIFICATION

DATE DRILLED 5/01/13 BORING NO. B-1

GROUND ELEVATION 296' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING Hand Auger

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY AQP LOGGED BY AQP REVIEWED BY KHM

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 4-1/2 inches thick.
						GM	BASE: Brown, moist, dense to very dense, silty GRAVEL with sand.
			25.2			CL	FILL: Dark brown, moist, firm to stiff, sandy CLAY; scattered gravel and cobbles.
							VERY OLD PARALIC DEPOSITS: Reddish brown, damp to moist, moderately cemented, fine-grained SANDSTONE; scattered gravel; some clay.
5							Total Depth = 3.8 feet. Groundwater not encountered during excavation. Backfilled on 5/01/13.
							Note: Groundwater, though not encountered at the time of excavation, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
10							
15							
20							

Ninyo & Moore

BORING LOG

FIRE STATION NO. 5 ALLEY IMPROVEMENTS
3902 9TH AVENUE, SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107260002	5/13	A-1

DATE DRILLED 5/01/13 BORING NO. B-2

GROUND ELEVATION 296' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING Hand Auger

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY AQP LOGGED BY AQP REVIEWED BY KHM

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							ASPHALT CONCRETE: Approximately 6-1/2 inches thick.
						GM	BASE: Brown, moist, medium dense to dense, silty GRAVEL with sand.
						CL	FILL: Dark brown, damp, firm, sandy CLAY; scattered gravel.
							VERY OLD PARALIC DEPOSITS: Reddish brown, damp to moist, moderately cemented, fine-grained SANDSTONE; scattered gravel; some clay.
5							Total Depth = 3 feet. Groundwater not encountered during excavation. Backfilled on 5/01/13. Note: Groundwater, though not encountered at the time of excavation, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
10							
15							
20							

Ninyo & Moore

BORING LOG

FIRE STATION NO. 5 ALLEY IMPROVEMENTS
3902 9TH AVENUE, SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107260002	5/13	A-2

DATE DRILLED 5/01/13 BORING NO. B-3

GROUND ELEVATION 295' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING Hand Auger

DRIVE WEIGHT N/A DROP N/A

SAMPLED BY AQP LOGGED BY AQP REVIEWED BY KHM

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							PORTLAND CEMENT CONCRETE: Approximately 7 inches thick.
						GM	BASE: Dark brown, moist to wet, medium dense, silty GRAVEL with sand.
			14.0			CL	FILL: Brown, moist, stiff, CLAY; scattered gravel. Wet.
5							Total Depth = 4 feet. Groundwater not encountered during excavation. Backfilled on 5/01/13. Note: Groundwater, though not encountered at the time of excavation, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.
10							
15							
20							

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BORING LOG

FIRE STATION NO. 5 ALLEY IMPROVEMENTS
3902 9TH AVENUE, SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107260002	5/13	A-3

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System in general accordance with ASTM D 2488. Soil classifications are indicated on the logs of exploratory borings in Appendix A.

Moisture Content

The in-place moisture content of soil samples obtained from the exploratory borings was evaluated in accordance with ASTM D 2216. The test results are presented on the boring logs in Appendix A.

Soil Corrosivity Tests

Soil pH, and resistivity tests were performed on a representative sample in general accordance with CT 643. The soluble sulfate and chloride content of the selected sample were evaluated in general accordance with CT 417 and CT 422, respectively. The test results are presented on Figure B-1.

R-Value

The resistance value, or R-value, for site soils was evaluated in general accordance with CT 301. Sample was prepared and evaluated for exudation pressure and expansion pressure. The equilibrium R-value is reported as the lesser or more conservative of the two calculated results. The test results are shown on Figure B-2.

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-1	1.0-2.0	9.4	830	780	0.078	80

[1] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 643
[2] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 417
[3] PERFORMED IN GENERAL ACCORDANCE WITH CALIFORNIA TEST METHOD 422

Ninyo & Moore		CORROSIVITY TEST RESULTS	FIGURE
PROJECT NO.	DATE	FIRE STATION NO. 5 ALLEY IMPROVEMENTS 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	B-1
107260002	5/13		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	SOIL TYPE	R-VALUE
B-3	1.5-4.0	CLAY (CL)	10

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2844/CT 301

Ninyo & Moore		R-VALUE TEST RESULTS	FIGURE
PROJECT NO.	DATE	FIRE STATION NO. 5 ALLEY IMPROVEMENTS 3902 9TH AVENUE SAN DIEGO, CALIFORNIA	B-2
107260002	5/13		

107260002_R-Value TABLE page 1.xls

APPENDIX E

WATER QUALITY TECHNICAL STUDY (WQTS)

WATER QUALITY STUDY
FOR
FIRE STATION NO. 5 HILLCREST

Job Number 16631
November 12, 2012

RICK ENGINEERING COMPANY
ENGINEERING COMPANY
RICK ENGINEERING CO

RICK
ENGINEERING COMPANY

WATER QUALITY STUDY

FOR

FIRE STATION NO. 5 HILLCREST

Job Number 16631

Jayne M. Janda-Timba, P.E.
R.C.E. #70649
Exp. 06/13

Prepared for:

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November 12, 2012

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2.0 Permanent Storm Water Best Management Practices (BMPs) 4
2.1 Source Control BMPs 4
2.2 Low Impact Development Design Practices 11
2.3 Buffer Measures 13
3.0 Conclusion 14

Figures

Figure 1: Vicinity Map 3

Appendices

Appendix A: Storm Water Requirements Applicability Checklist
Appendix B: Water Quality Sensitive Area Map
Appendix C: Fire Station No. 5 Water Quality Study Exhibit

1.0 INTRODUCTION

1.1 Project Description

This water quality study summarizes storm water protection requirements for Fire Station No. 5 Hillcrest project (herein referred to as "the project"). The project is located at the northwest corner of University Avenue and Ninth Avenue, in the City of San Diego. See Figure 1, Vicinity Map, located at the end of Section 1.0.

The proposed project consists of improving Fire Station No. 5 and minor sidewalk improvements along the adjacent public right of way. Fire Station No. 5 will be a two-story structure, which will contain 9 dorm rooms, a kitchen/dining room, dayroom, watch room, exercise room, lounge, and three bays for apparatus.

1.2 Determination for Permanent BMP Requirements

Requirement for permanent BMPs are determined based on criteria set forth in the City of San Diego's Storm Water Requirements Applicability Checklist. Projects are identified by three categories.

- Priority Development Project
- Standard Development Project
- Exempted Project

Pursuant to the storm water requirements applicability checklist (SWRAC), this project is a Standard Development Project. Based on Part B, Number 11 on the storm water requirements applicability checklist (SWRAC), the project must install and/or replace 5,000 square feet or more of impervious surface and the existing site must meet at least one of the definitions of Priority Development Project Requirements to be considered a Significant Redevelopment project. This project does not meet the above requirements and therefore is not considered a Significant Redevelopment project. Separate SWRAC was prepared for on-site (fire station building and parking lot) improvements and for off-site (public roadway, i.e. sidewalks), for details refer to Appendix A.

Additionally, the project is not located within a water quality sensitive area. See Appendix B for a copy of the project location in proximity to water quality sensitive areas within the City of San Diego, and SWRAC.

This water quality study describes the permanent storm water Best Management Practices (BMPs) that will be incorporated into the project in order to mitigate the impacts of pollutants in storm water runoff from the proposed project. For the purposes of post-construction storm water quality management, the project will follow the guidelines and requirements set forth in the City of San Diego's "Storm Water Standards," dated January 20, 2012 (herein "Storm Water Standards"), adopted by the City of San Diego.

1.3 Drainage Characteristics

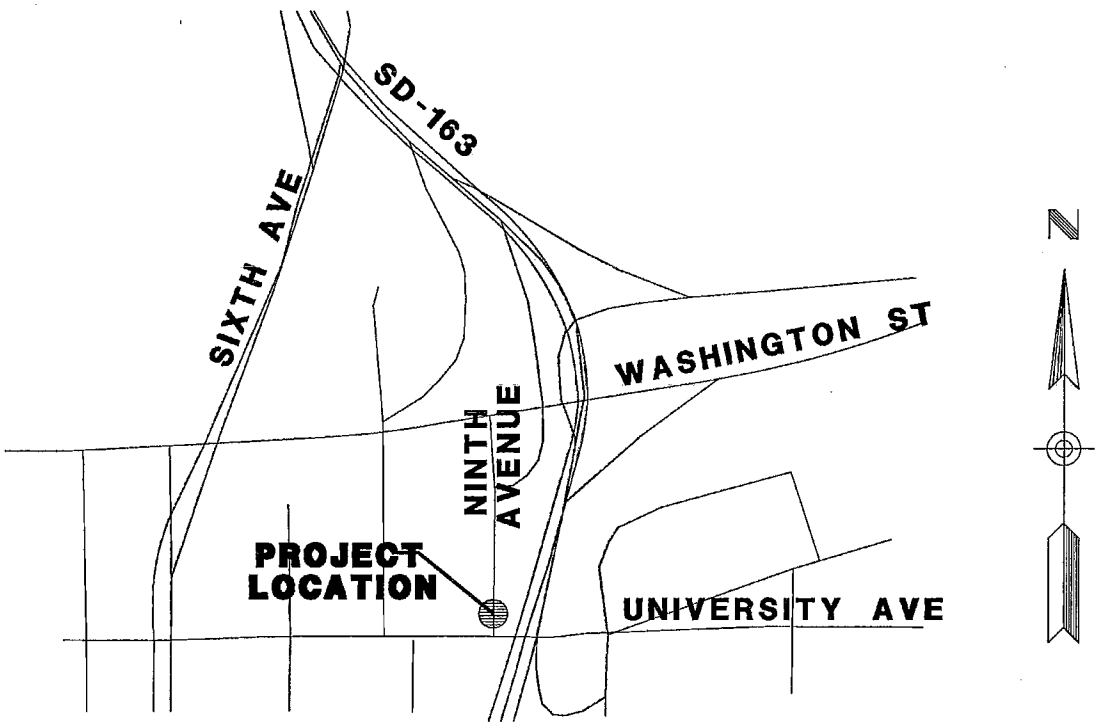
The existing site is a fire station with a parking lot and some landscaping. The site area is 0.38 acres. The site runoff drains towards University Avenue and proceeds east across Ninth Avenue and continues until it reaches a curb inlet at the northwest corner of University Avenue and Tenth Avenue. The distance from the project site to the curb inlet is approximately 325 feet.

The proposed project consists of improving Fire Station No. 5 Hillcrest and minor sidewalk improvements along the adjacent public right of way. The percent imperviousness of the project area, drainage patterns, and peak flow rates will remain consistent with pre-project conditions. The proposed project will drain to the same curb inlet that captures flow during existing conditions that is located approximately 325 feet east of the project site on University Avenue.

For drainage study details refer to approved "Drainage Letter for Fire Station No. 5," prepared by Rick Engineering Company (Job Number 16631), dated May 11, 2012.

The following section of this Water Quality Study describes the permanent BMPs to be implemented for the project (Section 2.0)

Figure 1: Vicinity Map



VICINITY MAP

NO SCALE

2.0 PERMANENT STORM WATER BEST MANAGEMENT PRACTICES (BMPS)

The project is a Standard Development Project. The following discussion addresses requirements of Section 3 of the Storm Water Standards, to establish permanent BMPs.

Sections 2.1 through 2.3 of this Water Quality Study will discuss the permanent storm water BMPs proposed for the project.

2.1 Source Control BMPs

The term "source control BMP" refers to land use or site planning practices, or structures that aim to prevent urban runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between pollutants and urban runoff. The following text discusses the source control BMPs from Section 3.1 of the Storm Water Standards with respect to the project. Italicized text is taken directly from the Storm Water Standards, and reproduced for this report. Portions of the italicized text are condensed from the Storm Water Standards. Immediately following and written in regular text, will be the response as it applies to the project.

a. Maintenance Bays

- *Maintenance bays shall include at least one of the following:*
    1. *Repair/maintenance bays shall be indoors; or,*
    2. *Drainage system designed to preclude urban run-on and runoff.*

Maintenance bays shall include a repair/maintenance bay drainage system to capture all wash water, leaks and spills. Drains shall be connected to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm water conveyance system is prohibited

The project does not propose any Maintenance Bays.

b. Vehicle and Equipment Wash Areas

- *Areas for washing/steam cleaning of vehicles and areas for outdoor equipment/accessory washing and steam cleaning shall be:*
    1. *Self-contained to preclude run-on and run-off, covered with a roof or overhang, and equipped with a clarifier or other pretreatment facility; and*
    2. *Properly connected to a sanitary sewer.*

Vehicle and equipment wash areas will be designed pursuant to the guidelines above

c. Outdoor Processing Areas

- *Outdoor processing areas shall:*
    1. *Cover and enclose areas that would be the most significant source of pollutants;*
    2. *Slope the area toward a dead-end sump; or*
    3. *Discharge to the sanitary sewer system*

Berms or site grading shall be utilized to prevent run-on from surrounding areas. Installation of storm drains in areas of equipment repair is prohibited.

The project does not propose Outdoor Processing Areas.

d. Retail and Non-Retail Fueling Areas

- *Retail and non-retail fueling areas shall be:*
    1. *Paved with Portland cement concrete or equivalent smooth impervious surface (asphalt concrete is prohibited);*
    2. *Designed to extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 foot (0.3 meter), whichever is less;*
    3. *Sloped to prevent ponding*

4. *Separated from the rest of the site by a grade break that prevents run-on of adjacent urban runoff; and*
5. *Designed to drain to the project's treatment control BMP(s) prior to discharging to the storm water conveyance system.*

- *The overhanging roof structure or canopy shall be:*
  1. *Equal to or greater than the area within the fuel dispensing area's grade break; and*
  2. *Designed to drain away from the fuel dispensing area.*

Fueling areas will be designed pursuant to the guidelines above.

e. Steep Hillside Landscaping

- *Steep hillside areas disturbed by project development shall be landscaped with deep-rooted, drought tolerant and/or native plans species selected for erosion control, in accordance with the Landscape Technical Manual.*

The project does not propose Steep Hillside Landscaping.

f. Use Efficient Irrigation Systems and Landscape Design

- *Implement rain shutoff devices to prevent irrigation during and after precipitation events in accordance with section 2.3-4 of the City of San Diego's Landscape Standards (See Suggested Resources in Appendix A)*
- *Reduce irrigation contribution to dry-weather runoff by avoiding spray irrigation patterns where overspray to paved surfaces or drain inlets will occur.*
- *To avoid overwatering and potential irrigation runoff, design the irrigation systems to each landscape area's specific water requirement*
- *Implement flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines*

- *Avoid locating drain inlets in lawn areas, since such inlets tend to be sources of irrigation runoff and the transport mechanism for lawn care products. Design the grading and drainage systems such that drain inlets can be located outside of the lawn area or include a non-turf buffer around the inlet.*

Irrigation system and landscaping will be designed pursuant to the guidelines shown above.

g. Design Trash Storage Areas to Reduce Pollution Contribution

- *Trash storage areas shall:*
    1. *Be paved with an impervious surface designed to prevent run-on from adjoining areas and screened or walled to prevent off-site transport of trash.*
    2. *Contain attached lids on all trash containers to prevent rainfall intrusion.*
    3. *Contain a roof or awning, at the discretion of the City, for high usage trash areas such as those for fast food establishments, convenience stores, and high density residential developments.*

Trash storage areas for the project will be designed pursuant to the guidelines shown above.

h. Design Outdoor Material Storage Areas to Reduce Pollution Contribution

- *Materials with the potential to contaminate urban runoff shall be:*
    1. *Placed in an enclosure such as a cabinet, shed, or other structure that prevents contact with rainfall or runoff and prevents spillage to the storm water conveyance system, and*
    2. *Protected by secondary containment structures such as berms, dikes or curbs when the material storage area includes hazardous materials. The storage areas shall be paved and sufficiently impervious to contain leaks and spills and to be covered by a roof or awning to minimize direct precipitation within the secondary containment area.*

This project does not propose Outdoor Material Storage Areas.

i. Design Loading Docks to Reduce Pollution Contribution

- *Loading dock areas shall:*
    1. *Provide overhead cover where appropriate to prevent precipitation contact with debris and potential spills, and*
    2. *Isolate drainage in the loading dock areas through the use of paved berms and/or grade breaks to prevent adjacent runoff from entering the loading area and to prevent liquid spills from discharging from the loading area.*
    3. *Include an acceptable method of spill containment such as a shut-off valve and containment areas.*

The project does not propose Loading Docks.

j. Employ Integrated Pest Management Principles

- *Integrated pest management (IPM) is an ecosystem-based pollution prevention strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as:*
    1. *Biological Control*
    2. *Habitat Manipulation*
    3. *Use of resistant plant varieties*

Pesticides are used only after monitoring indicates they are needed according to established guidelines. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the surrounding environment. More information regarding pesticide application may be obtained at the following University of California-Davis website:
http://www.ipm.cdavis.edu/WATER/U/index.html.

- *To eliminate or reduce the need for pesticide use, the following strategies can be used:*
    1. *Plant pest-resistant or well-adapted plant varieties*
    2. *Discourage pests by modifying the site and landscape design*

- *IPM educational materials should be distributed to future site residents and tenants. These materials should address the following:*
    1. *Use of barriers, screens, and caulking to keep pests out of buildings and landscaping*
    2. *Physical pest elimination techniques, such as weeding, washing, or trapping pests*
    3. *Relying on natural enemies to eliminate pests*
    4. *Proper use of pesticides as a last line of defense*

Pest management will be implemented pursuant to the guidelines above.

k. Provide Storm Water Conveyance System Stamping and Signage

- *Concrete stamping, or approved equivalent method, shall be provided for all storm water conveyance system inlets and catch basins within the project area.*
- *Language associated with the stamping (e.g., "No Dumping- I Live in San Diego Bay") must be satisfactory to the City Engineer. Stamping may also be required in Spanish.*
- *Post signs and prohibitive language (with graphical icons) which prohibit illegal dumping at trailheads, parks, building entrances and public access points along channels and creeks within the project area.*

This project only includes a ribbon gutter within the parking lot and does not propose any other storm water conveyance systems, inlets or catch basins, within the project area.

l. Manage Fire Sprinkler System Discharges

- *For new buildings with fire sprinkler systems, design fire sprinkler system as follows:*
    1. *Contain discharged from sprinkler systems' operational maintenance and testing and convey discharges to the sanitary sewer system*

Fire Sprinkler System will be designed pursuant to guidelines shown above.

m. Manage Air Conditioning Condensate

- *Air conditioning condensate is a source of dry-weather runoff and elevated copper levels. Include design features to manage this pollutant source, including the following:*
    1. *Direct air conditioning condensate to the sanitary sewer system*
    2. *Direct air conditioning condensate to landscaping areas*

Air Conditioning system will be designed pursuant to the guidelines shown above.

n. Use Non-Toxic Roofing Materials Where Feasible

- *Avoid the use of galvanized steel or copper for roofs, gutters, and downspouts*
- *If using such materials, reduce the potential for leaching of metals by applying a coating or patina*
- *Avoid composite roofing materials that contain copper*

The use of Roofing Materials will be designed pursuant to the guidelines above. The use of galvanized metal flashing will be minimized for roofs.

o. Other Source Control Requirements

- *Require implementation of post-construction soil stabilization practices, such as the re-vegetation of construction sites, in conformance with the approved Landscaping Plan and Grading Plans*
- *Provide for pet waste and collection dispensers where applicable*
- *Restrict the use of galvanized and copper roofing materials*

The project will implement all applicable post-construction soil stabilization practices in conformance with the Landscaping and Grading Plans. The use of pet waste and collection dispensers is not applicable to this project. This project will minimize the use of galvanized and copper roofing materials.

2.2 Low Impact Development (LID) Design Practices

The term LID means a storm water management and land development strategy that emphasizes conservation and the use of on-site natural features integrated with engineered, small-scale hydrologic controls to more closely reflect pre-development hydrologic functions. The following text discusses the low impact development BMPs from Section 3.2 of the Storm Water Standards with respect to the project. Italicized text is taken directly from the Storm Water Standards, and reproduced for this report. Portions of the italicized text are condensed from the Storm Water Standards. Immediately following and written in regular text, will be the response as it applies to the project.

2.2.1 Additional Guidance on Low-Impact Development Design

1. Optimize the site layout.

The project will minimize storm water related impacts by avoiding excessive grading and disturbance of vegetation and soils. The project will preserve significant trees by excavating and relocating trees onsite. Project proposes improvements to already existing building and parking

lot; therefore no significant grading and compaction is anticipated, and minimum disturbance is expected to adjacent areas.

2. *Minimize Impervious Footprint*

Landscaped areas will be provided to help minimize overall impervious footprint. The project site is already developed, and consists of fire station building, parking lot, and adjacent sidewalks. Proposed improvements preserve the same percent imperviousness, no new paved areas are proposed, and overall landscaping area will be the same as in pre-project condition. Impervious surfaces will be directed to pervious areas to the maximum extent practicable (MEP) to help reduce the "effective" percent imperviousness for the project.

3. *Disperse Runoff to Adjacent Landscaping*

Where feasible, runoff from impervious asphalt will be directed to adjacent landscaped areas. Most of the Fire Station No. 5 building roof will drain to the parking lot. The parking lot runoff will be collected in the ribbon gutter, and directed towards landscaped area via an opening through the Concrete Masonry Unit (CMU) wall prior to discharging to the University Avenue.

4. *Construction Considerations*

Project will minimize soil compaction. The landscaping for the project will be designed in accordance with the City of San Diego's Landscape Technical Manual.

5. *Additional Consideration*

Stormwater runoff from the site will discharge to an existing storm drain system. Concentrated flow from ribbon gutter will be directed to landscaped area; therefore cobbles will be placed to help dissipate the energy. The project does not redirect, increase, or alter stormwater runoff; discharge and flow path are consistent with the pre-project condition.

2.3 Buffer Measures

Pursuant to Section 3.3, *buffer zones surrounding natural water bodies should be utilized where feasible.*

The project is not located near a natural water body; therefore, buffer measures do not apply.

3.0 CONCLUSION

This water quality study summarizes permanent storm water management requirements and proposed design features to reduce discharges of pollutants to the City storm water conveyance system to the maximum extent possible. Based on the City of San Diego's SWRAC, the project is considered a Standard Development Project.

The project will incorporate Source Control BMPs including:

- Soil Stabilizing Practices in accordance with Erosion Control and Landscape Plans
- Efficient Irrigation Systems and Landscaping Design
- Implementation of integrated pest management practices
- Properly designed vehicle and equipment wash areas
- Properly designed fueling areas
- Design trash storage areas to reduce pollution contribution
- Properly managed air conditioning condensate
- Properly managed fire sprinkler system
- Use of non-toxic roofing materials were feasible

The project will incorporate Low-Impact Development Design Practices such as:

- Utilizing existing topography to optimize the site layout and reduce the need for grading
- Preservation of significant trees and maintaining the same pre-project landscaping footprint
- Directing runoff from impervious areas to adjacent pervious landscaped areas
- Overall impervious surface area will be the same as in the pre-project condition

The project has incorporated storm water management features in accordance with the City of San Diego Storm Water Standards, dated January 20, 2012.

APPENDIX A

Storm Water Requirements Applicability Checklist

THE CITY OF SAN DIEGO City of San Diego Development Services 1222 First Ave., MS-302 San Diego, CA 92101 (619) 446-5000	**Storm Water Requirements Applicability Checklist**	FORM **DS-560** JANUARY 2011

Project Address:	Project Number *(for City Use Only)*:
3902 9th Avenue, San Diego, CA (on-site)	

SECTION 1. Permanent Storm Water BMP Requirements:

Additional information for determining the requirements is found in the Storm Water Standards Manual.

Part A: Determine if Exempt from Permanent Storm Water BMP Requirements.

Projects that are considered maintenance, or are otherwise not categorized as "development projects" or "redevelopment projects" according to the Storm Water Standards manual are not required to install permanent storm water BMPs. **If "Yes" is checked for any line in Part A, proceed to Part C and check the box labeled "Exempt Project." If "No" is checked for all of the lines, continue to Part B.**

1.	The project is not a Development Project as defined in the Storm Water Standards Manual: for example habitat restoration projects, and construction inside an existing building.	☐ Yes ☑ No
2.	The project is only the construction of underground or overhead linear utilities.	☐ Yes ☑ No
3.	The project qualifies as routine maintenance (replaces or renews existing surface materials because of failed or deteriorating condition). This includes roof replacement, pavement spot repairs and resurfacing treatments such as asphalt overlay or slurry seal, and replacement of damaged pavement.	☐ Yes ☑ No
4.	The project only installs sidewalks, bike lanes, or pedestrian ramps on an existing road, and does not change sheet flow condition to a concentrated flow condition.	☐ Yes ☑ No

Part B: Determine if Subject to Priority Development Project Requirements.

Projects that match one of the definitions below are subject to additional requirements including preparation of a Water Quality Technical Report.

If "Yes" is checked for any line in Part B, proceed to Part C and check the box labeled "Priority Development Project." If "No" is checked for all of the lines, continue to Part C and check the box labeled "Standard Development Project."

1.	**Residential development of 10 or more units.**	☐ Yes ☑ No
2.	**Commercial development and similar non-residential development greater than one acre.** Hospitals; laboratories and other medical facilities; educational institutions; recreational facilities; municipal facilities; commercial nurseries; multi-apartment buildings; car wash facilities; mini-malls and other business complexes; shopping malls; hotels; office buildings; public warehouses; automotive dealerships; and other light industrial facilities.	☐ Yes ☑ No
3.	**Heavy industrial development greater than one acre.** Manufacturing plants, food processing plants, metal working facilities, printing plants, and fleet storage areas.	☐ Yes ☑ No
4.	**Automotive repair shop.** Facilities categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.	☐ Yes ☑ No
5.	**Restaurant.** Facilities that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), and where the land area for development is greater than 5,000 square feet.	☐ Yes ☑ No
6.	**Hillside development greater than 5,000 square feet.** Development that creates 5,000 square feet of impervious surface and is located in an area with known erosive soil conditions and where the development will grade on any natural slope that is twenty-five percent or greater.	☐ Yes ☑ No
7.	**Water Quality Sensitive Area.** Development located within, directly adjacent to, or discharging directly to a Water Quality Sensitive Area (as depicted in Appendix C) in which the project either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" is defined as being situated within 200 feet of the Water Quality Sensitive Area. "Discharging directly to" is defined as outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.	☐ Yes ☑ No
8.	**Parking lot with a minimum area of 5,000 square feet or a minimum of 15 parking spaces** and potential exposure to urban runoff (unless it meets the exclusion for parking lot reconfiguration on line 11).	☐ Yes ☑ No

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Upon request, this information is available in alternative formats for persons with disabilities.

DS-560 (01-25-11)

9.	**Street, road, highway, or freeway.** New paved surface in excess of 5,000 square feet used for the transportation of automobiles, trucks, motorcycles, and other vehicles (unless it meets the exclusion for road reconfiguration on line 11).	☐ Yes ☑ No
10.	**Retail Gasoline Outlet (RGO)** that is: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.	☐ Yes ☑ No
11.	**Significant Redevelopment;** project installs and/or replaces 5,000 square feet or more of impervious surface and the existing site meets at least one of the categories above. The project is not considered Significant Redevelopment if reconfiguring an existing road or parking lot without a change to the footprint of an existing developed road or parking lot. The existing footprint is defined as the outside curb or the outside edge of pavement when there is no curb.	☐ Yes ☑ No
12.	**Other Pollutant Generating Project.** Any other project not covered in the categories above, that disturbs one acre or more and is not excluded by the criteria below.	☐ Yes ☑ No

Projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces or if they sheet flow to surrounding pervious surfaces.

Part C: Select the appropriate category based on the outcome of Parts A & B.

1.	If "Yes" is checked for any line in Part A, then check this box. Continue to Section 2.	☐ Exempt Project
2.	If "No" is checked for all lines in Part A, and Part B, then check this box. Continue to Section 2.	☑ Standard Development Project
3.	If "No" is checked for all lines in Part A, and "Yes" is checked for at least one of the lines in Part B, then check this box. Continue to Section 2. See the Storm Water Standards Manual for guidance on determining if Hydromodification Management Plan requirements apply.	☐ Priority Development Project

SECTION 2. Construction Storm Water BMP Requirements:
For all projects, complete Part D. If "Yes" is checked for any line in Part D, then continue to Part E.

Part D: Determine Construction Phase Storm Water Requirements.

1.	Is the project subject to California's statewide General NPDES Permit for Storm Water Discharges Associated with Construction Activities? (See State Water Resources Control Board Order No. 2009-0009-DWQ for rules on enrollment)	☐ Yes ☑ No
2.	Does the project propose grading or soil disturbance?	☑ Yes ☐ No
3.	Would storm water or urban runoff have the potential to contact any portion of the construction area, including washing and staging areas?	☑ Yes ☐ No
4.	Would the project use any construction materials that could negatively affect water quality if discharged from the site (such as, paints, solvents, concrete, and stucco)?	☑ Yes ☐ No
5.	Check this box if "Yes" is checked for line 1. Continue to Part E.	☐ SWPPP Required
6.	Check this box if "No" is checked for line 1, and "Yes is checked for any line 2-4. Continue to Part E.	☑ WPCP Required
7.	Check this box if "No" is checked for all lines 1-4. Part E does not apply.	☐ No Document Required

Part E: Determine Construction Site Priority

This prioritization must be completed with this form, noted on the plans, and included in the SWPPP or WPCP. The City reserves the right to adjust the priority of the projects both before and during construction. [Note: The construction priority does NOT change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by City staff.]

☐ 1. **High Priority**
- a) Projects where the site is 50 acres or more and grading will occur during the wet season
- b) Projects 1 acre or more and tributary to an impaired water body for sediment (e.g., Peñasquitos watershed)
- c) Projects 1 acre or more within or directly adjacent to or discharging directly to a coastal lagoon or other receiving water within a Water Quality Sensitive Area.
- d) Projects subject to phased grading or advanced treatment requirements.

☐ 2 **Medium Priority.** Projects 1 acre or more but not subject to a high priority designation.

☑ 3 **Low Priority.** Projects requiring a Water Pollution Control Plan but not subject to a medium or high priority designation.

Name of Owner or Agent *(Please Print):* Title:

Signature: Date:

THE CITY OF SAN DIEGO City of San Diego Development Services 1222 First Ave., MS-302 San Diego, CA 92101 (619) 446-5000	**Storm Water Requirements Applicability Checklist**	FORM **DS-560** JANUARY 2011

Project Address:	Project Number *(for City Use Only)*:
3902 9th Avenue, San Diego, CA (off-site public r/w)	

SECTION 1. Permanent Storm Water BMP Requirements:

Additional information for determining the requirements is found in the Storm Water Standards Manual.

Part A: Determine if Exempt from Permanent Storm Water BMP Requirements.

Projects that are considered maintenance, or are otherwise not categorized as "development projects" or "redevelopment projects" according to the Storm Water Standards manual are not required to install permanent storm water BMPs. **If "Yes" is checked for any line in Part A, proceed to Part C and check the box labeled "Exempt Project." If "No" is checked for all of the lines, continue to Part B.**

1.	The project is not a Development Project as defined in the Storm Water Standards Manual: for example habitat restoration projects, and construction inside an existing building.	☐ Yes ☑ No
2.	The project is only the construction of underground or overhead linear utilities.	☐ Yes ☑ No
3.	The project qualifies as routine maintenance (replaces or renews existing surface materials because of failed or deteriorating condition). This includes roof replacement, pavement spot repairs and resurfacing treatments such as asphalt overlay or slurry seal, and replacement of damaged pavement.	☐ Yes ☑ No
4.	The project only installs sidewalks, bike lanes, or pedestrian ramps on an existing road, and does not change sheet flow condition to a concentrated flow condition.	☑ Yes ☐ No

Part B: Determine if Subject to Priority Development Project Requirements.

Projects that match one of the definitions below are subject to additional requirements including preparation of a Water Quality Technical Report.

If "Yes" is checked for any line in Part B, proceed to Part C and check the box labeled "Priority Development Project." If "No" is checked for all of the lines, continue to Part C and check the box labeled "Standard Development Project."

1.	**Residential development of 10 or more units.**	☐ Yes ☐ No
2.	**Commercial development and similar non-residential development greater than one acre.** Hospitals; laboratories and other medical facilities; educational institutions; recreational facilities; municipal facilities; commercial nurseries; multi-apartment buildings; car wash facilities; mini-malls and other business complexes; shopping malls; hotels; office buildings; public warehouses; automotive dealerships; and other light industrial facilities.	☐ Yes ☐ No
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8.	**Parking lot with a minimum area of 5,000 square feet or a minimum of 15 parking spaces** and potential exposure to urban runoff (unless it meets the exclusion for parking lot reconfiguration on line 11).	☐ Yes ☐ No

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10.	**Retail Gasoline Outlet (RGO)** that is: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.	☐ Yes ☐ No
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Part C: Select the appropriate category based on the outcome of Parts A & B.

1.	If "Yes" is checked for any line in Part A, then check this box. Continue to Section 2.	☑ Exempt Project
2.	If "No" is checked for all lines in Part A, and Part B, then check this box. Continue to Section 2.	☐ Standard Development Project
3.	If "No" is checked for all lines in Part A, and "Yes" is checked for at least one of the lines in Part B, then check this box. Continue to Section 2. See the Storm Water Standards Manual for guidance on determining if Hydromodification Management Plan requirements apply.	☐ Priority Development Project

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Part D: Determine Construction Phase Storm Water Requirements.

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4.	Would the project use any construction materials that could negatively affect water quality if discharged from the site (such as, paints, solvents, concrete, and stucco)?	☑ Yes ☐ No
5.	Check this box if "Yes" is checked for line 1. Continue to Part E.	☐ SWPPP Required
6.	Check this box if "No" is checked for line 1, and "Yes is checked for any line 2-4. Continue to Part E.	☑ WPCP Required
7.	Check this box if "No" is checked for all lines 1-4. Part E does not apply.	☐ No Document Required

Part E: Determine Construction Site Priority

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☐ 1. **High Priority**
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- b) Projects 1 acre or more and tributary to an impaired water body for sediment (e.g., Peñasquitos watershed)
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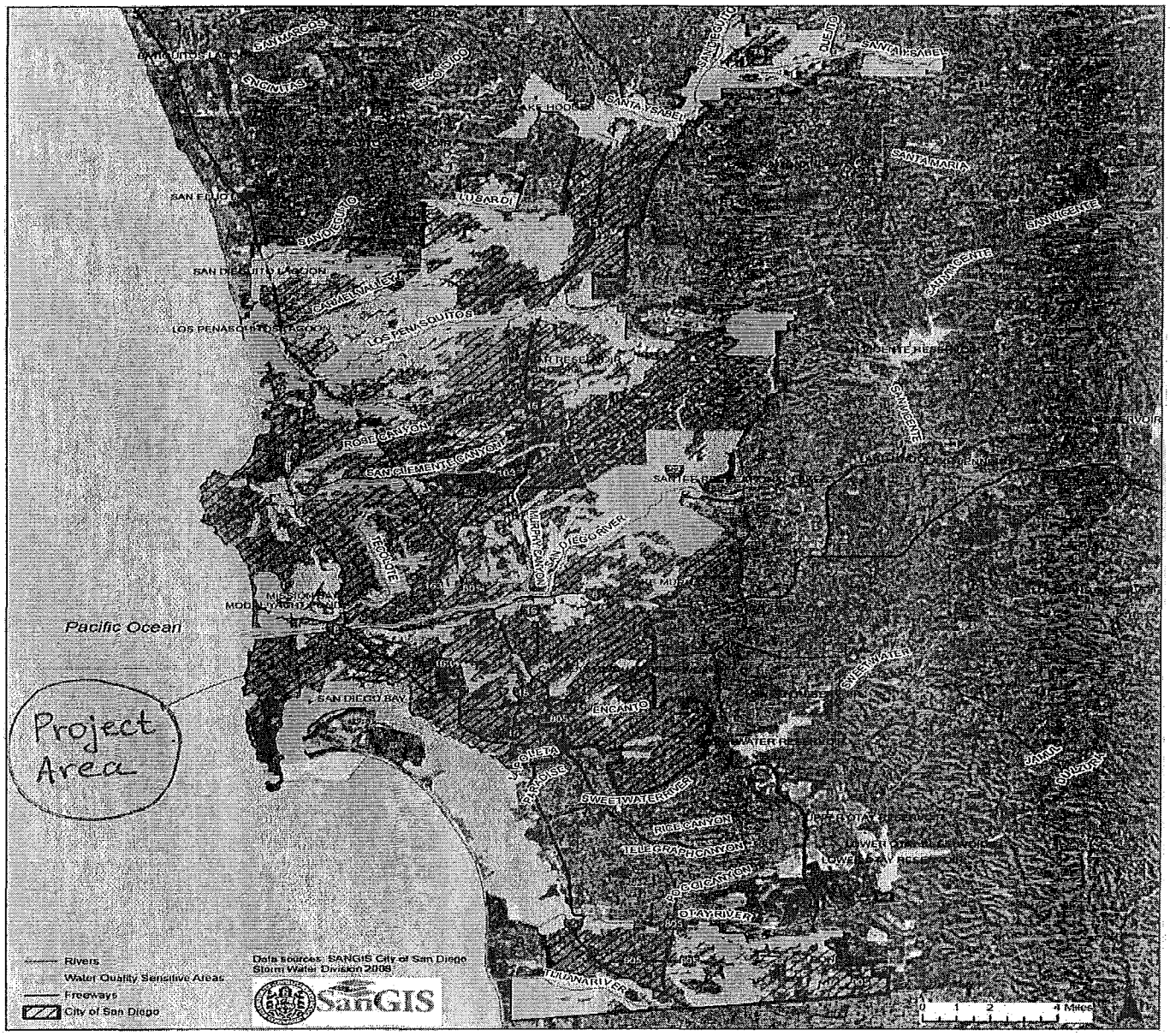
☑ 3 **Low Priority.** Projects requiring a Water Pollution Control Plan but not subject to a medium or high priority designation.

Name of Owner or Agent *(Please Print):* Title:

Signature: Date:

APPENDIX B

Water Quality Sensitive Area Map

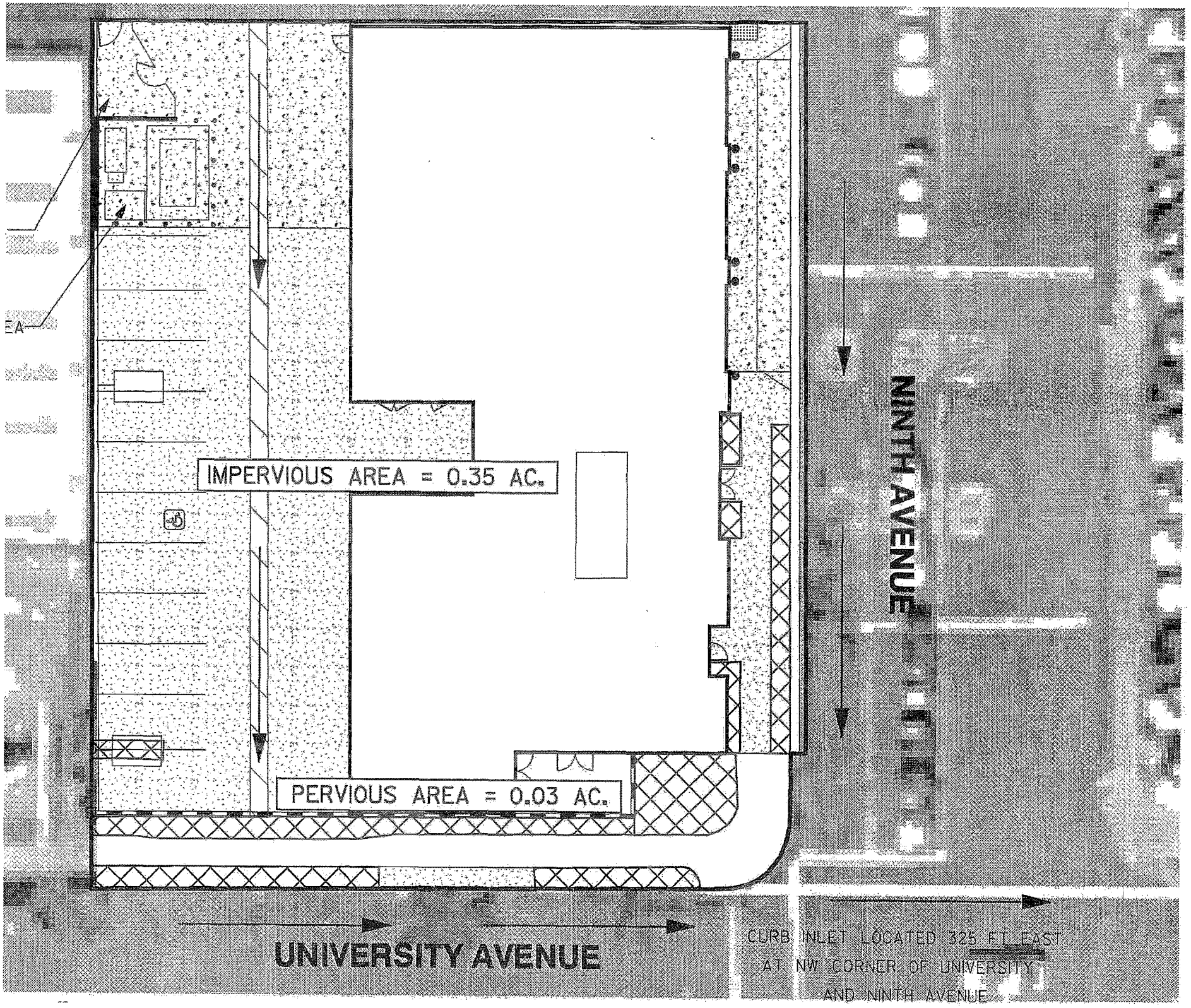


Water Quality Sensitive Areas within the City Of San Diego

Note: This map is printed here for reference only. A more detailed map with parcel lines is available utilizing the interactive map at the SanGIS website at, www.sangis.org, or by contacting SanGIS at 5469 Kearny Villa Road, Suite 102, San Diego, CA 92123, or by phone at (858) 874-7000. The Water Quality Sensitive Areas map has been produced under the direction of the City of San Diego solely for the purpose of assisting development project applicants in complying with the City's Storm Water Standards Manual. This map was prepared at a regional scale and may not accurately represent conditions on individual sites. Applicants may submit a proposal to refine the boundaries of the Water Quality Sensitive Areas with the project.

APPENDIX C

Fire Station No. 5 Hillcrest Water Quality Study Exhibit


IMPERVIOUS AREA = 0.35 AC.
PERVIOUS AREA = 0.03 AC.
NINTH AVENUE
UNIVERSITY AVENUE
CURB INLET LOCATED 325 FT. EAST
AT NW CORNER OF UNIVERSITY
AND NINTH AVENUE

APPENDIX F

LEED COMMISSIONING PLAN

Commissioning Plan

San Diego Fire Rescue
Fire Station No. 5 - Hillcrest

Plan prepared for:

San Diego Fire-Rescue

3902 Ninth Avenue

San Diego, California 92103

February 28 , 2013

prepared by:

MA Engineers
5160 Carroll Canyon Road, Suite 200
San Diego, CA 92121

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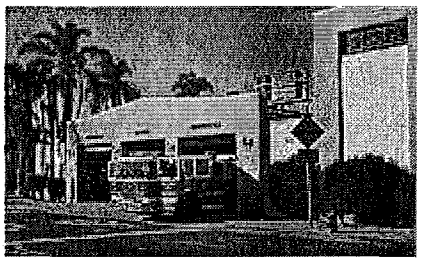
1. Introduction

Fire Station No. 5 will be a 10,595 square foot facility. The building will contain 9 dormitory rooms, a kitchen / dining room, day room, watch room, exercise room, lounge, and three apparatus bays.

The project is pursuing Silver certification under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) green building rating system. Sustainable features include; water efficient landscaping and reducing water use by 30%, reducing energy use 20%, diverting construction waste from landfills, use of sustainable materials with recycled content and sourced regionally, and use of low emitting volatile organic compound (VOC) materials.



This document, referred to as the Commissioning Plan or "Cx Plan" defines the scope of the building commissioning effort. This includes an overview of the commissioning process, the roles and responsibilities of team members, the specific equipment to be commissioned, and an anticipated schedule of commissioning activities.

This document defines a commissioning process that complies with the LEED for Green Building Design & Construction 2009 Edition *Energy and Atmosphere Prerequisite 1 – Fundamental Commissioning of the Building Energy Systems* (EAp1).

This commissioning plan is intended to be a "living" document and may be revised periodically during design, construction and testing.

1.1 Commissioning Scope

Commissioning (Cx) is a systematic quality assurance process to ensure that building equipment / systems are installed and operate according to the owner's operational needs, design intent, and construction documents.

The commissioning process focuses on the following specific activities:

- Review Owner's Project Requirements and Basis of Design documentation prepared in conjunction with the Owner and design team *(EAp1)*
- Develop and implement a commissioning plan *(EAp1)*
- Provide commissioning specifications / requirements for inclusion in the construction documents *(EAp1)*
- Review contractor submittals applicable to the systems being commissioned
- Verify proper installation and start-up of commissioned equipment through the use of prefunctional checklists and periodic site inspections *(EAp1)*
- Verify functional performance of commissioned systems and assist in issue resolution *(EAp1)*
- Complete a summary commissioning report of findings *(EAp1)*

1.2 Commissioned Systems

Systems commissioned as part of this project will include the following:

- **Heating, ventilating, air conditioning, refrigeration and associated controls**
    - Variable Refrigerant Flow (VRF) split-system air conditioning units
    - Building Automation System
- **Lighting and daylighting controls**
    - Manual Wall Switches, Occupancy sensors, Time Clocks (as applicable)
    - Integration with Ring Down / Alerting System
- **Domestic hot water systems**
    - Gas Fired Hot Water Heater
- **Renewable energy systems**
    - Rooftop Mounted Photovoltaic System

2. Commissioning Team Communication

2.1 Contact Information

Team Member	Contact Names & Companies	Phone, address, & email address
Owner	Michelle Abella-Shon San Diego Fire Rescue	Office: Fax: Address: Email:
Owner	Rowaida Jadan San Diego Fire Rescue	Office: Fax: Address: Email: RJadan@sandiego.gov
Architect / LEED Consultant	Maryanne Welton Rob Wellington Quigley, FAIA	Office: 650-328-8030 Fax: 650-328-8032 Address: 210 High Street Palo Alto, CA 94301 Email: mare@robquigley.com
Mechanical Engineer	Roy Campbell MA Engineers	Office: 858-200-0030 Fax: 858-200-0037 Address: 5160 Carroll Canyon Road, Suite 200 San Diego, CA 92121 Email: rcampbell@ma-engr.com
Electrical Engineer	Paul Carey O'Mahony & Myer	Office: 415-492-0420 Fax: 415-479-9662 Address: 4340 Redwood Hwy, Suite 245 San Rafael, CA 94903 Email: pcarey@ommconsulting.com
Electrical Engineer	Jan Myer O'Mahony & Myer	Office: 415-492-0420 Fax: 415-479-9662 Address: 4340 Redwood Hwy, Suite 245 San Rafael, CA 94903 Email: jmyer@ommconsulting.com
Plumbing Engineer	Jerry Coult MA Engineers	Office: 858-200-0030 Fax: 858-200-0037 Address: 5160 Carroll Canyon Road, Suite 200 San Diego, CA 92121 Email: jcoult@ma-engr.com
Commissioning Agent	Jerry Ingwalson MA Engineers	Office: 858-200-0030 Fax: 858-200-0037 Cell: 858-230-5979 Address: 5160 Carroll Canyon Road, Suite 200 San Diego, CA 92121 Email: jingwalson@ma-engr.com
Commissioning Agent	Tom Lunneberg MA Engineers	Office: 858-200-0030 Fax: 858-200-0037 Cell: 760-805-3230 Address: 5160 Carroll Canyon Road, Suite 200 San Diego, CA 92121 Email: tlunneberg@ma-engr.com
Mechanical Contractor		Office:

Team Member	Contact Names & Companies	Phone, address, & email address
		Fax: Cell: Address: Email:
Electrical Contractor		Office: Fax: Cell: Address: Email:
Plumbing Contractor		Office: Fax: Cell: Address: Email:
Controls Contractor		Office: Fax: Cell: Address: Email:

2.2 Communication Protocols

As the project moves from design to construction to functional performance testing the CA may communicate directly with team members to facilitate the commissioning process and any issue resolution, but will also ensure other team member remained informed. Guidelines for this communication are provided below.

For requests for information (RFI) or formal documentation requests:	The CA goes through the Architect
For minor or verbal information and clarifications:	The CA may go direct to the informed party.
For notifying contractors of deficiencies:	The CA documents deficiencies through the Contractor, but may discuss deficiency issues with sub-contractors prior to notifying the Contractor.
For scheduling functional tests:	The CA shall provide input for scheduling and some coordination for testing; however the main responsibility for coordination of relevant parties lies with the Contractor.
For scheduling commissioning meetings:	The CA communicates the date and schedules through the Contractor.
For making a request for significant changes:	The CA has no authority to issue change orders. The CA may request a change through the owner's representative.
For project schedule	The CA goes through the Contractor.
Sub-contractors disagreeing with requests or interpretations by the CA:	Try and resolve with the CA first. Then work through Contractor who shall work with CA directly or through the owner's representative to resolve the situation.
For bringing up issues not included above:	The CA contacts the Architect

3. Roles and Responsibilities

Commissioning is a team process and requiring efforts from multiple parties in order to be successful. Parties are not limited to but include the owner, design engineers, and contractors.

3.1 Commissioning Team Roles

A general overview of commissioning team member functions and deliverables is provided below.

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Team Member	Function	Written Cx Products
Owner	Define system performance criteria Provide access to information relating to base building systems design, facility staff, and maintenance procedures. Provide input in to scope and type of training	Owner's Performance Requirements
LEED Consultant	Direct & Coordinate the LEED process. Maintain LEED scorecard Submit credit interpretation requests as required Assemble submittal documentation Prepare final submittal package Prepare credit re-submittals as required Prepare credit appeal as required	Credit Interpretation Requests (As Required) LEED Scorecards LEED Submittal Credit Re-submittal (As Required) Credit Appeal (As Required)
Commissioning Authority (CA)	Coordinate the Cx process Develop commissioning specifications Develop a commissioning plan Participate in subcontractor interviews as required Review contractor submittals for commissioned equipment / systems Develop prefunctional checklists and final startup plans Periodically observe equipment / system installation during construction Develop functional performance test procedures Oversee, direct, and document functional performance testing Prepare a summary report of findings	Cx Specifications Cx Plan Prefunctional checklists Functional performance test procedures Progress reports Cx deficiency reports Commissioning report
Design Team (A/E)	Define system performance characteristics (i.e. Basis of Design) Periodically observe equipment / system installation during construction Resolve questions relating to system design Review and approve TAB report	Basis of Design Document Cx meeting minutes during design
General Contractor (GC)	Integrate commissioning into the construction process and master schedule Facilitate and support the Cx process Provide equipment submittals as requested by the CA	Cx meeting minutes during construction O&M Manuals Construction submittals (Equipment / Manufacturer)
Sub Contractors (Subs)	Execute prefunctional checklists Execute functional performance test procedures under the direction of the CA Demonstrate proper system performance	Construction submittals (Equipment / Manufacturer) Manufacturer startup reports Completed prefunctional checklists

3.2 Responsibility Matrix

A list of the responsibilities and tasks for each party of the commissioning team is presented in the table below. The member designated as the leader for a given task shall coordinate the overall execution of that task. Included under each task are sub-tasks with participating members identified with and "X". Participants identified under a given task may be asked to assist in an as-needed / as-directed role.

Task	Commissioning Responsibilities and Tasks		Commissioning Authority	Owner / Construction Manager	Project Architect	Design Engineers	General Contractor	Mechanical Contractor	Electrical Contractor	Controls Contractor
A	**Overall coordination of the Cx work**	Lead	X							
	Develop and update the Commissioning Plan		X							
	Plan and conduct commissioning meetings		X							
	Coordinate commissioning activities		X				X			
	Review and comment on the Commissioning Plan			X	X	X	X			
	Maintain meeting minutes						X			
	Ensure commissioning tasks are carried out		X		X		X			
B	**Owner's Project Requirements**	Lead		X						
	Develop OPR			X	X					
	Review OPR		X			X				
	Update OPR and provide a record copy at the end of construction			X	X					
C	**Basis of Design**	Lead				X				
	Develop BOD				X	X				
	Review BOD		X	X						
	Update BOD and provide a record copy at the end of construction				X	X				
D	**Cx specifications**	Lead	X							
	Provide commissioning related specification language for inclusion in the construction documents		X							
	Review and Integrate commissioning specifications into the construction documents			X	X					
E	**Commissioning Kickoff Meeting (construction)**	Lead	X							
	Attend commissioning kickoff meeting		X	X			X	X	X	X
	Review and comment on the commissioning plan			X			X	X	X	X
	Maintain meeting minutes						X			
F	**Contractor Submittals for Commissioned Equipment**	Lead					X			

Task	Commissioning Responsibilities and Tasks	Commissioning Authority	Owner / Construction Manager	Project Architect	Design Engineers	General Contractor	Mechanical Contractor	Electrical Contractor	Controls Contractor
	Provide equipment submittals, O&M data, and other data for the commissioned systems as requested to the CA					X	X	X	X
	Review selected submittals for commissioned systems	X							
	Re-submit equipment as necessary					X	X	X	X
G	**Start-up and Prefunctional Checklists** Lead	X							
	Develop prefunctional checklists	X							
	Review checklists					X	X	X	X
	Execute checklists					X	X	X	X
	Perform site visits & witness contractor startup	X							
	Provide completed checklists & TAB report to CA prior to functional performance testing					X			
	Review completed prefunctional checklists & TAB report	X							
H	**Functional Performance Testing** Lead	X							
	Develop functional performance test procedures	X							
	Review test procedures (CA has final content approval)		X		X	X	X	X	X
	Execute functional performance testing	X				X	X	X	X
I	**Warranty Period** Lead	X							
	Complete any required deferred testing a	X				X	X	X	X
K	**Final Commissioning Report** Lead	X							

4. Design Phase Commissioning Process

4.1 Owner's Project Requirements Document

Developed by the owner, a written Owner's Performance Requirements (OPR) document shall help the entire team focus on the aspects of the project which are most important to the owner. As applicable to the project, these requirements should include the following areas[1]:

- Owner and user requirements
- Environmental and sustainability goals
- Energy efficiency goals
- Indoor environmental quality requirements
- Equipment and system expectations
- Building occupant and O&M personnel requirements

The CA as well as other team members may assist the owner with the development of the OPR as required. The CA will review the OPR.

4.2 Basis of Design Documents

The design team shall develop a Basis of Design Document (BOD) to describe how the facility, equipment, systems will meet the owner's needs as outlined in the OPR. As applicable the BOD should include the following[2]:

- Primary design assumptions
    - Space use, redundancy, diversity, climatic design conditions, space zoning, occupancy, operations, and space environmental requirements.
- Standards
    - Applicable codes, guidelines, regulations, and other references that will be put into practice
- Narrative descriptions
    - Include performance criteria for the HVAC&R systems, lighting systems, hot water systems, on-site power systems, and other systems to be commissioned.

The CA will review the BOD.

4.3 Develop / Implement Commissioning Plan

The CA develops a draft Commissioning Plan for the project during the design phase. This document shall be used to guide the commissioning process and to inform project team members on commissioning activities, responsibilities, and milestones. The draft Commissioning Plan shall be submitted to the owner, design team, and the contractors for review and comment.

[1] LEED Reference Guide for Green Building Design and Construction 2009 Edition, page 222

[2] LEED Reference Guide for Green Building Design and Construction 2009 Edition, page 223

As required the CA updates the Commissioning Plan throughout the course of the project and submits the revised drafts to the owner, owner's representative, design team, and contractors as appropriate.

4.4 Design Phase Coordination Meetings

Prior to meeting the construction team the CA will have a commissioning kickoff meeting with the owner and design team. The primary intent is allow the owner and design team to review and comment on the commissioning plan to ensure the process meets the needs of the project.

Additional meetings will be scheduled by the CA as required.

4.5 Commissioning Specifications / Requirements

The CA will review the commissioning specifications included in the construction documents. Please note, although the individual tasks may be delegated to sub-contractors ultimate responsibility for compliance for with the specifications lies with the Contractor.

The specifications shall include, but not be limited to defining the features and systems to be commissioned, roles and responsibilities, requirements for equipment startup, functional performance testing, issue resolution, and acceptance.

4.6 Contractor Submittal Review

Equipment submittals relevant to commissioned systems shall be routed to the CA in parallel with the normal distribution process. Submittals for commissioned equipment and systems will be reviewed for quality assurance and for compliance with the owner's project requirements and basis of design. The CA does not have the authority to approve or reject submittals; submittal review for contract compliance is the A/E's responsibility.

Submittals may include but are not limited to equipment cut sheets, shop drawings, TAB plan, installation manuals and manufacturer startup forms, building management system point lists and detailed sequences of operation. The information will be used to develop the prefunctional checklists and functional performance tests.

4.7 Issues Log

The CA shall develop and maintain a commissioning issues log for assisting in follow-up, determining deficiencies, and assigning responsibility for corrective actions. This log will be maintained throughout the course of the project.

The CA shall coordinate with the owner (or owner's representative) and the design team to identify and resolve issues as they arise. This process shall begin in the design phase and continue through and after construction.

5. Construction Phase Commissioning Process

5.1 Commissioning Kickoff Meeting

The contractor and sub-contractors shall be provided with the Commissioning Plan for review and comment prior to a commissioning kickoff meeting. Questions and comments regarding the commissioning process shall be addressed in order to ensure clarity and understanding by the parties involved. Roles, responsibilities, tasks, and a preliminary schedule for commissioning activities shall also be discussed. Members of the commissioning team required to attend shall be identified prior to the meeting.

Typically this meeting will be scheduled two to three months prior to equipment installation, however please note there will be coordination between the CA and Contractor prior to the all-hands kickoff meeting.

5.2 Periodic Site Inspections

During construction, the CA shall make periodic visits to the site to witness equipment and system installations. Subsequent to each site visit, any comments will be provided to the owner, design team, and construction team via a commissioning site visit report.

5.3 Construction Phase Meetings

The CA shall attend selected coordination and construction meetings in order to remain informed on project progress and to update parties involved in the commissioning process.

Coordination meetings shall be scheduled, through the contractor, as required. These meetings may be scheduled as often as weekly once the start-up phase of the commissioned systems begins. During construction commissioning meetings may be combined with weekly MEP meetings in order to minimize the time impact on the construction team.

Meetings may continue beyond substantial completion if significant issues are outstanding. During these meetings, attendance by relevant members of the team shall be required.

5.4 Progress Reporting and Issue Log

Throughout the commissioning process, the CA shall provide periodic progress reports as required. Progress reports shall also be generated as start-up and testing for the commissioned systems proceeds.

During functional performance testing, reports may be issued as often as daily to inform team members of issues as timely as possible in order to facilitate resolution. Additionally, the daily reports shall keep the owner informed as to the progress of commissioning activities.

The reports shall be integrated into a master issue log that shall be updated as issues arise and get resolved.

5.5 Prefunctional Checklists

The intent of the prefunctional checklists is to verify proper installation and start up and resolve obvious deficiencies prior to functional performance testing, thereby shortening the duration of functional performance testing. Individual checklists shall be developed for each piece of equipment. Additionally, these checklists are intended to supplement, not replace any manufacturer installation / startup checklists or documentation.

Checklists may include items such as leak testing, voltage testing, rotational checks, instrument calibration, verifying variable frequency drive parameter programming, testing & balancing, labeling, and control system point-to-point checks.

Multiple trades participate in completing each checklists and performing equipment start-up.

5.5.1 Prefunctional Checklist Development

Based on equipment submittals, contractor startup forms, manufacturer documentation and commonly identified issues the CA shall develop draft prefunctional checklists specific to the equipment / project. The commissioning team shall be provided with the draft checklists for review and comment. As much as possible contractor forms and review comments shall be integrated with the checklists in order to avoid duplication.

The contractor shall physically attach (via clear plastic sheath and zip tie) each checklist to its respective piece of equipment prior to equipment startup. Manufacturer installation / startup documentation (copies of completed documentation are acceptable) shall also be included within the sheath. Alternatively, installation / startup documentation may be centrally located within the construction trailer as long as access is provided to installing contractors.

5.5.2 Prefunctional Checklist Execution

Prior to and during equipment startup the checklist line items shall be completed by the individual actually performing the work. Parties responsible for indicating line items as complete shall be noted on individual line items. Checklists shall be spot checked by the CA during installation and startup. The CA shall be informed of the schedule of startup activities for each commissioned system, including power-up, manufacturer start-up, and testing & balancing.

When complete, the checklists shall be provided to the CA for review and approval. It is important to note that prefunctional checklists ***must*** be successfully completed prior to the commencement of functional performance testing. In addition testing and balancing (TAB) ***must*** be completed and a preliminary report submitted, or final if available, to the CA for review prior to functional performance testing.

5.5.3 Certificate of Completion

In addition to providing the CA the completed prefunctional checklists, a Certificate of Completion shall also be provided. The certificate shall certify the installation, prefunctional checklists, manufacturer startup documentation, and contractor documentation have been completed.

5.6 Functional Performance Testing

The goal of functional performance testing is to assess complete system operation by evaluating the interaction of individual components. Unlike prefunctional checklists, complete systems (e.g. chilled water system including chillers, pumps etc.) rather than individual pieces of equipment (e.g. chilled water pump) are tested concurrently.

The scope of functional performance testing includes automated controls, sequences of operation, and equipment function during various modes of operation. Testing criteria include design intent, basis of design, manufacturer requirements and sequences of operation.

5.6.1 Functional Performance Test Procedure Development

Prior to testing, the CA develops draft test procedures in a sequential written form and distributes to the team for review and comment. After design and construction team comments have been integrated, final functional performance test procedures shall be issued. Every suggestion / comment will be considered by the CA, however final authority as to content lies with the CA.

5.6.2 Certificate of Readiness

Prior to functional performance testing, the contractor shall provide the CA a Certificate of Readiness certifying the commissioned systems, subsystems, equipment, and associated controls are complete, have been tested and adjusted, are functionally performing in accordance with the contract documents, and are read for commissioning testing and verification (i.e. functional performance testing).

5.6.3 Execution of Functional Performance Test Procedures

The controls programmer shall perform the test in conjunction with, and under the direction of the CA. Installing contractor (s) / manufacturer (s) may be required for support during testing or to assist with problem resolution. Functional performance testing shall be scheduled through the contractor.

Attendance by the facility engineering staff is highly encouraged. Although the engineering staff is not a direct participant in the testing process, observation of the functional performance testing is a valuable resource for "hands-on" equipment / systems training. Witnessing of functional performance testing does not relieve either the engineering staff or Contractor of formal training required by the contract documents, but provides an excellent opportunity for supplemental training and facilitation of system operation.

5.7 Issue Resolution

Continuing from the design phase, the CA shall proactively coordinate with SDCCD (or the owner's designated representative), the Contractor, and the design team to resolve deficiencies identified through the prefunctional checklists and functional performance testing of equipment and systems.

Identified issues shall be included in the master issues log developed in the design phase. The commissioning team shall develop retesting plans and direct retesting of systems, as necessary, to confirm that deficiencies have been corrected.

6. Post Occupancy Commissioning Process

6.1 Seasonal / Deferred Testing

Building systems may require tuning during the first year, after handover, of occupancy. During this period, the commissioning team shall evaluate building systems to ensure that the systems perform properly though the different seasons and modes of operation.

Depending on the project schedule and other factors, it may be in the project's best interest to simulate different weather conditions with the building automation system (for example, by adjusting setpoints to simulate different loads) as opposed to waiting for ideal weather conditions. Final authority as to whether testing shall be deferred, or if conditions shall be simulated lies with the CA.

Functional performance testing shall proceed as described in *Section 5.6 Functional Performance Testing*.

6.2 Summary Commissioning Report

The CA shall provide a final commissioning report to the Owner. The report shall include the following components[3]:

- Owner's project requirements
- Project commissioning specifications
- Verification of installation (prefunctional checklists)
- Functional performance testing results and forms
- Description of commissioning process benefits
- Outstanding issues

[3] LEED Reference Guide for Building Design and Construction 2009 Edition, page 228

7. Schedule

The following table summarizes the general schedule for commissioning activities. This schedule will be periodically updated:

Task / Activity	Estimated Date
Owner designates commissioning agent	
CA submits draft Commissioning Plan	February 2013
Design team reviews draft Commissioning Plan	March 2013
Kickoff meeting with design team	
Owner submits Owner's Project Requirements	February 2013
CA reviews Owner's Project Requirements	March 2013
Design team submits Basis of Design	October 2012
CA reviews Basis of Design	November 2012
CA develops commissioning specifications / requirements	January 2013
Contractor provides CA with submittals for commissioned systems	
CA reviews contractor submittals for commissioned systems	
Construction phase commissioning kickoff meeting	
CA submits draft prefunctional checklists	
Contractor reviews draft prefunctional checklists and comment	
CA incorporates comments and issues final prefunctional checklists	
Contractor executes prefunctional checklists	
CA develops / provides draft functional performance test procedures	
Contractor reviews draft functional performance test procedures	
CA incorporates comments and issues final functional performance test procedures	
CA, Contractor and Sub-Contractors execute Functional Performance Test Procedures	
CA submits Final Commissioning Report	
LEED consultant submits LEED package	

APPENDIX G

SDG&E LEGAL AND PLAT EASEMENT

J-16631A

EXHIBIT "A"

SDG&E EASEMENT

Those portions of Lots 7, 8, and 9 in Block C of Estudillo and Capron's Addition in the City of San Diego, County of San Diego, State of California, according to Map thereof No. 650 filed in the Office of the County Recorder of San Diego County December 4, 1890, being more particularly described as follows:

Beginning at a point in the South line of said Block C of Map No. 650 which bears North 89°44'29" East 19.67 feet from the Southwest Corner of said Lot 7 in Block C of Map No. 650; thence along said South line South 89°44'29" West 6.11 feet; thence leaving said South line North 11°04'54" West 64.33 feet; thence North 00°10'59" West 5.33 feet; thence North 89°49'01" East 8.50 feet; thence South 00°10'59" East 2.01 feet; thence South 84°49'46" East 52.84 feet; thence South 00°11'30" East 6.03 feet; thence North 84°49'46" West 54.75 feet; thence South 11°04'54" East 61.75 feet to the **TRUE POINT OF BEGINNING.**

Containing 753.906 Square Feet, more or less.

Attached hereto is Exhibit "B" and by reference made a part hereof.

7-7-2014

Patrick A. McMichael, L.S. 6187 Date

Ec:k:files_16631a_SDGE esmt

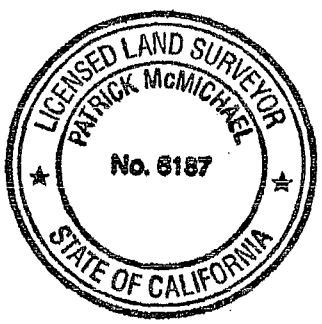
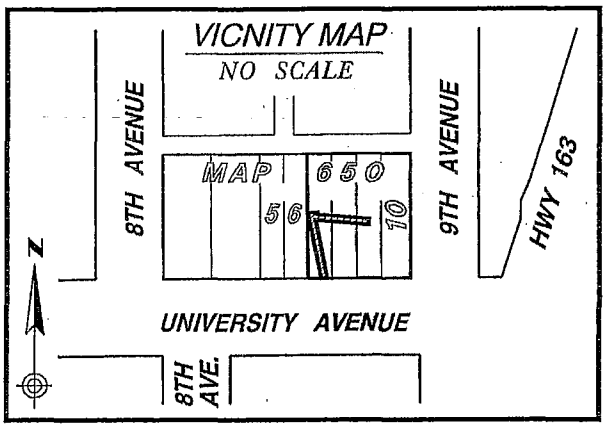


EXHIBIT 'B'

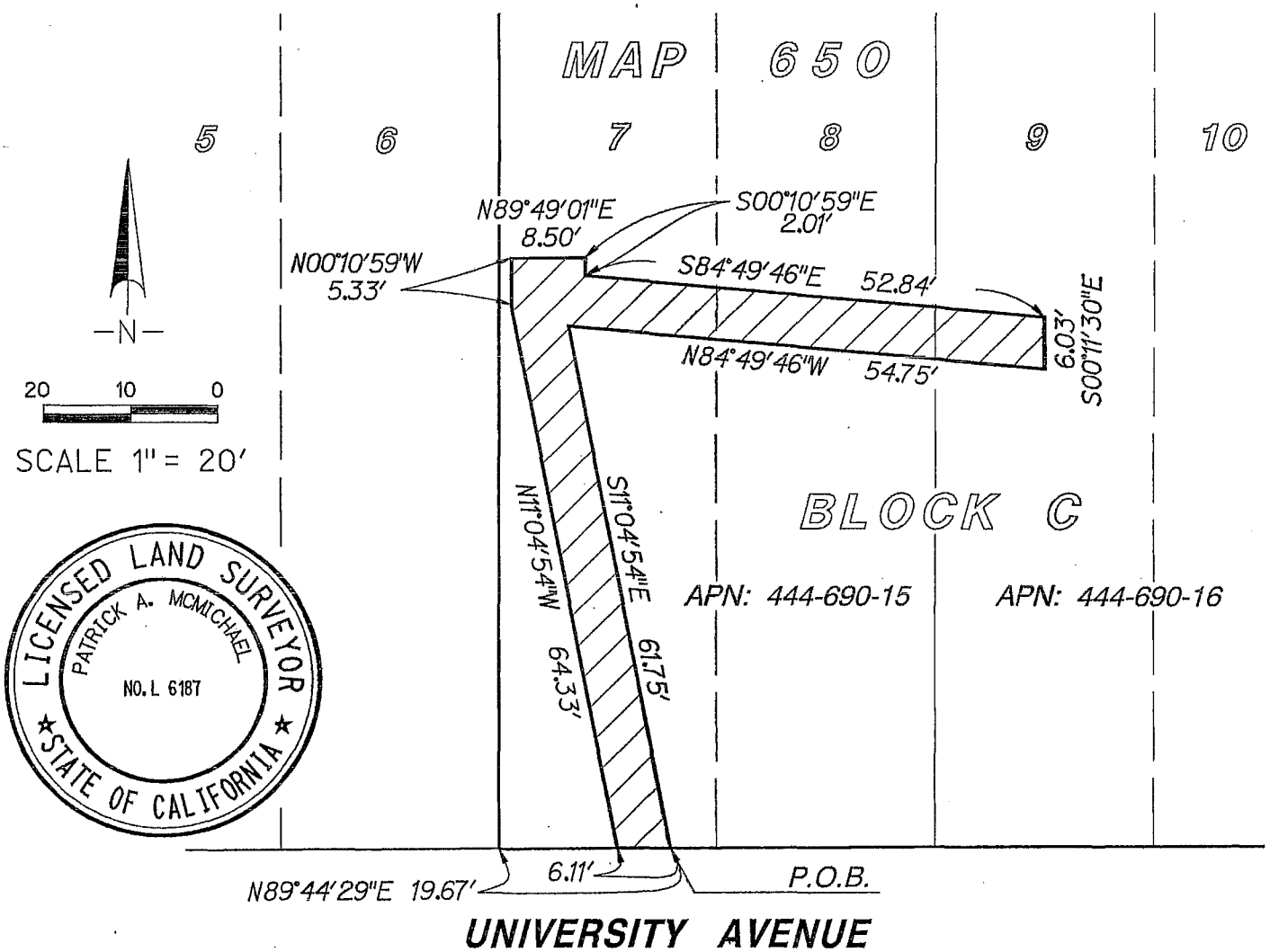
SHEET 1 OF 1



LEGEND

SDG&E EASEMENT ACQUIRED HEREON 753.906 SQ. FT.

P.O.B. POINT OF BEGINNING



LICENSED LAND SURVEYOR
PATRICK A. McMICHAEL
NO. L 6187
STATE OF CALIFORNIA

RICK ENGINEERING COMPANY
5620 FRIARS ROAD J. 16631-A
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165

PATRICK A. McMICHAEL, LS 6187 — DATE 7-7-2014

SDG&E EASEMENT

OVER THOSE PORTIONS OF LOTS 7, 8 AND 9 IN BLOCK C OF MAP NO. 650

M:\16631\Survey\Easement\16631_SDGE_exb_01.dgn
\\srv_photo1\RickStandards\Bentley_2006\workspace\projects\CorpStds_2005_SD\plot\CorpStds_2005_SD.pen

APPENDIX H

ASBESTOS REPORT AND HRB HISTORICAL DETERMINATION

THE CITY OF SAN DIEGO

M E M O R A N D U M

DATE: July 27, 2010

TO: Yousef Ibrahim, Associate Civil Engineer, Engineering & Capital Projects; Architectural Engineering and Parks Division

FROM: Robert Cox, Asbestos & Lead Program Inspector
via Alan J. Johanns, Asbestos & Lead Program Manager, Environmental Services Department; Energy, Sustainability, and Environmental Protection Division

SUBJECT: Asbestos and lead inspection for Fire Station 5

Per your request, the Asbestos and Lead Management Program (ALMP) performed asbestos and lead sampling in preparation of demolition of Fire Station 5, located at 3902 9th Ave on June 24, 2010.

An ALMP records search found previous asbestos survey results performed in 2002 and before for this facility and its additions. Records indicated asbestos containing roofing mastic was abated in 2004, but samples were collected of the new mastic materials during this inspection to verify it did not contain asbestos.

The June 24, 2010 inspection consisted of sampling materials that were not previously sampled and a visual assessment of previously identified asbestos containing materials to verify condition. This survey was nondestructive in nature and did not include materials concealed behind walls and hard ceilings. The following is a summary of the asbestos results:

Asbestos Summary

Fire Station #5 Asbestos Pre-existing Sample Results

SAMPLE #	TYPE OF MATERIAL	LOCATION	CONDITION	ASBESTOS (%)
5327-1A	wall plaster	bull pen	good	ND
5327-1B	wall plaster	battalion chief office	good	ND
5327-1C	wall plaster	dorm	good	ND
5327-2	black 9"x9" floor tile	bull pen, , Chiefs bathroom	good	1-4%

Other Hazardous Materials Summary
Based on previous survey results in 2002, approximately 90 mercury containing fluorescent light bulbs and 45 PCB containing ballasts are present.

Recommendations
Identified asbestos containing materials, lead containing materials and other hazardous materials as listed in this report must be removed prior to demolition. Because of the exterior brick coated with lead paint, I recommend that the abatement of the materials described above be included in the overall specification for this project vs. having the abatement work performed under a separate contract with the City's as-needed abatement contractor. ALMP can provide you the needed abatement technical language for your specification. ALMP should also review the general demolition specifications to ensure all work is done in accordance with applicable local state and federal regulations and to ensure there is no conflict with the abatement specification.

If you have any questions or are ready to proceed on this project and require the abatement portion of the specification, please contact me at 858-492-5015 or rcox@sandiego.gov.

Robert Cox
Asbestos and Lead Program Inspector

Attachments:
1. Asbestos Laboratory Results
2. Lead Paint Testing Results
3. Asbestos and Lead Report 8-28-02

memo2010\1412

PLM Report

Report No:	136686	**Customer:**	City of San Diego 9601 Ridgehaven Ct. #320 San Diego, CA 92123
Date:	June 29, 2010		
Date Received:	June 28, 2010		
Date Analyzed:	June 29, 2010	**Attention:**	Robert Cox
Date/Time Collected:	Jne 24, 2010 by Robert Cox	**Reference:**	PO#1078974; Project#6470
Subject:	Polarized Light Microscopy Analysis for Asbestos	3	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
1	NON-FRIABLE	BLACK/GRAY TAR LIKE	NONE DETECTED	CELLULOSE 15%	GRANULAR MINERALS, OPAQUES
2	NON-FRIABLE	GRAY SOLID	NONE DETECTED	NONE DETECTED	GRANULAR MINERALS, OPAQUES
3	NON-FRIABLE	BLACK TAR LIKE	NONE DETECTED	CELLULOSE 10%	OPAQUES

RECEIVED

JUL 06 2010

ENVIRONMENTAL SECTION

Wesene Sebhat, Optical Microscopist

B.M. Kolk, Laboratory Director

BMK/mt

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.

SUBMITTAL FORM / Laboratory Services

138686

PAGE 1 OF 2

TURNAROUND TIME: STD ____ 48 HR. X 24 HR. ____
<8 HR. ____ WKND ____ OTHER: ____

RELINQUISHED BY RC
TIME / DATE 6/25/10

CLIENT City of San Diego
ADDRESS 9601 Ridgehaven CT 310
San Diego, CA
TELEPHONE 858-492-5015
CONTACT Robert Cox

DATE OF SHIPMENT 6/25 CARRIER FX
CLIENT P.O. NO. ____
CLIENT JOB/PROJECT ID NO(S). 6470
PACKAGE SHIPPED FROM ____

RESULTS REQUESTED VIA VERBAL ☐ FAX ☐ E-MAIL ☒ E-MAIL RCox@SanDiego.go
(NOTE: Complete written reports will follow all analyses, in addition to any prior transmitted verbal, fax or e-mail results) FAX NO. ____

DATE/TIME OF SAMPLE COLLECTION 6/24/10
SAMPLE PRESERVATIVES ____ HOLDING TIMES ____
NO. OF SAMPLES SENT 3 SAMPLER'S NAME [signature] / Robert Cox
(SIGNATURE) (PRINTED)

TYPE: ☐ WATER ☐ WASTE WATER ☐ SOIL ☐ FILTER ☐ SORBENT TUBE ☐ IMPINGER ☐ OTHER PUR

(FOR EMS ONLY) EMS Sample No.	CLIENT SAMPLE NO.	DESCRIPTION/LOCATION/ANALYSIS	VOLUME/ TIME/WEIGHT (IF APPLICABLE)
138686-1	1	Roof Penetration Mastic	
2	2	Window Putty	
3	3	Roof Duct Mastic	

138686

Laboratory No. ____ Received By [signature] Time 905
Date of Package Delivery 10/26/10 Shipping Bill Retained: YES ☒ NONE ☐
Condition of Package on Receipt OK Condition of Custody Seal NONE
(NOTE: If the package has sustained substantial damage or the custody seal is broken, stop and contact the project manager and the shipper.)

No. of Samples 3 Chain-of-Custody Signature ____
Date of Acceptance into Sample Bank 10/26/10 Misc. Info. ____
Disposition of Samples PUR LABC

FOR EMS ONLY

PLM Report

Report No:	138861	**Customer:**	City of San Diego 9601 Ridgehaven Ct. #320 San Diego, CA 92123
Date:	July 13, 2010		
Date Received:	July 7, 2010		
Date Analyzed:	July 13, 2010	**Attention:**	Robert Cox
Date/Time Collected:	July 2, 2010 by Robert Cox	**Reference:**	PO#1078974; Project#6470
Subject:	Polarized Light Microscopy Analysis for Asbestos	3	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
6470-1 FT	NON-FRIABLE	BLACK GRANULAR	CHRYSOTILE - GREATER THAN 1%	NONE DETECTED	GRANULAR MINERALS, OPAQUES, RESIN
6470-1 M	NON-FRIABLE	BLACK TAR LIKE	NONE DETECTED	CELLULOSE - LESS THAN 1%	GRANULAR MINERALS, OPAQUES, ORGANICS
6470-2	NON-FRIABLE	WHITE PAINT, WHITE/GRAY GRANULAR	NONE DETECTED	NONE DETECTED	GRANULAR MINERALS, OPAQUES

Jeff Wan, Optical Microscopist

B.M. Kolk, Laboratory Director

BMK/mt

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.

138861

SUBMITTAL FORM/*Laboratory Services*

Rush T/A

PAGE 1 OF 1

TURNAROUND TIME: STD X 48 HR. 24 HR. <8 HR. WKND OTHER:

RELINQUISHED BY Robert Cox
TIME / DATE 7/2/2010

CLIENT The City of San Diego
ADDRESS 9601 Ridgehaven Ct, Suite 310
San Diego, CA 92123
TELEPHONE (858) 492-5015
CONTACT Robert Cox

DATE OF SHIPMENT 7/2/10 CARRIER Fed Ex
CLIENT P.O. NO.
CLIENT JOB/PROJECT ID NO(S). 6490
PACKAGE SHIPPED FROM

RESULTS REQUESTED VIA VERBAL ☐ FAX ☐ CLIENT FAX NO. **EMAIL: rcox@sandiego.gov
(NOTE: Complete written reports will follow all analyses, in addition to any prior transmitted verbal or fax results.)

DATE/TIME OF SAMPLE COLLECTION 7/2/2010
SAMPLE PRESERVATIVES HOLDING TIMES
NO. OF SAMPLES SENT 5 SAMPLER'S NAME (SIGNATURE) Robert cox (PRINTED)
TYPE: ☐ WATER ☐ WASTE WATER ☐ SOIL ☐ FILTER ☐ SORBENT TUBE ☐ IMPINGER ☒ OTHER PLM

(FOR EMS ONLY) EMS Sample No.	CLIENT SAMPLE NO.	DESCRIPTION/LOCATION/ANALYSIS	VOLUME/AREA/WEIGHT
138861-1	6490-1	Floor Tile & Mastic /Captains office	
	6490-2	Wall Plaster/ Kitchen	
	6490-3	Wall Plaster/ Kitchen	
	6490-4	Wall Plaster/ Kitchen	
5	6490-5	Floor Tile Mastic/ Chiefs office	

[SF 5/09]

138861

FOR EMS ONLY

Laboratory No.
Received By Meung Ung Time 9:34
Date of Package Delivery 7/7/10
Shipping Bill Retained: YES ☒ NONE ☐
Condition of Package on Receipt ok
Condition of Custody Seal None
(NOTE: If the package has sustained substantial damage or the custody seal is broken, stop and contact the project manager and the shipper.)
No. of Samples 5
Chain-of-Custody Signature
Date of Acceptance into Sample Bank 7/7/10
Misc. Info.
Disposition of Samples EMS Labs

EMS·LABORATORIES 117 West Bellevue Drive / Pasadena CA 91105-2503 / 626-568-4065

City of San Diego/Lead Safe Neighborhoods Program

64701

XRF Assay Results

Reading #	Time	Type	Duration	Units	Sequen	Component	Substrate	Side	Condition	Color	Site	Inspector	Room	Depth	Action	Pbc
25	6/24/2010 10:07	SHUTTER_CAL	128.66	cps	Final											2.89
26	6/24/2010 10:09	PAINT	7.6	mg / cm ^2	Final	calibration				red	208	rc		1.14	1	1.1
27	6/24/2010 10:09	PAINT	5.81	mg / cm ^2	Final	calibration				red	208	rc		1.11	1	1
28	6/24/2010 10:10	PAINT	10.74	mg / cm ^2	Final	calibration				red	208	rc		1.04	1	0.9
29	6/24/2010 10:10	PAINT	1.34	mg / cm ^2	Final	calibration				red	208	rc		1.19	1	1.1
30	6/24/2010 10:10	PAINT	0.23	mg / cm ^2	Final	calibration				red	208	rc		1.14	1	0.9
31	6/24/2010 10:11	PAINT	8.7	mg / cm ^2	Final	calibration				red	208	rc		1.13	1	1.1
32	6/24/2010 10:15	PAINT	3.81	mg / cm ^2	Final	wall	brick	B	INTACT	WHITE	208	rc	OUTSIDE	6.73	1	1.5
33	6/24/2010 10:15	PAINT	3.36	mg / cm ^2	Final	wall	brick	B	INTACT	WHITE	208	rc	OUTSIDE	4.92	1	1.8
34	6/24/2010 10:16	PAINT	3.56	mg / cm ^2	Final	wall	brick	B	INTACT	WHITE	208	rc	OUTSIDE	5.48	1	1.4
35	6/24/2010 10:17	PAINT	3.35	mg / cm ^2	Final	wall	brick	A	INTACT	WHITE	208	rc	OUTSIDE	3.9	1	1.5
36	6/24/2010 10:17	PAINT	1.77	mg / cm ^2	Final	wall	brick	A	INTACT	WHITE	208	rc	OUTSIDE	5.5	1	2.2
37	6/24/2010 10:17	PAINT	1.79	mg / cm ^2	Final	wall	brick	A	INTACT	TAN	208	rc	OUTSIDE	5.35	1	3.8
38	6/24/2010 10:18	PAINT	2.91	mg / cm ^2	Final	wall	brick	A	INTACT	TAN	208	rc	OUTSIDE	5.3	1	2.9
39	6/24/2010 10:18	PAINT	1.57	mg / cm ^2	Final	wall	brick	D	INTACT	TAN	208	rc	OUTSIDE	5.21	1	3.9
40	6/24/2010 10:19	PAINT	1.56	mg / cm ^2	Final	DOOR	METAL	D	INTACT	RED	208	rc	OUTSIDE	1	1	0
41	6/24/2010 10:19	PAINT	0.89	mg / cm ^2	Final	DOOR fr	METAL	D	INTACT	RED	208	rc	OUTSIDE	1.94	1	2.9
42	6/24/2010 10:21	PAINT	1.56	mg / cm ^2	Final	brick	brick	D	INTACT	White	208	rc	OUTSIDE	5.69	1	2.4
43	6/24/2010 10:23	PAINT	3.56	mg / cm ^2	Final	brick	brick	D	INTACT	White	208	rc	GARAGE	2.82	1	0.2
44	6/24/2010 10:24	PAINT	3.36	mg / cm ^2	Final	brick	brick	D	INTACT	White	208	rc	GARAGE	3.25	1	0.03
45	6/24/2010 10:26	PAINT	2.02	mg / cm ^2	Final	brick	brick	A	INTACT	White	208	rc	GARAGE	1.65	1	0.01
46	6/24/2010 10:30	PAINT	3.79	mg / cm ^2	Final	brick	brick	A	INTACT	White	208	rc	GARAGE	2.53	1	0.23
47	6/24/2010 10:31	PAINT	1.35	mg / cm ^2	Final	brick	brick	A	INTACT	White	208	rc	GARAGE	1.65	1	0.08
48	6/24/2010 10:31	PAINT	2.92	mg / cm ^2	Final	brick	brick	A	INTACT	White	208	rc	GARAGE	4.01	1	0.23
49	6/24/2010 10:32	PAINT	1.56	mg / cm ^2	Final	DOOR	METAL	B	INTACT	RED	208	rc	Kitchen	1	1	0
50	6/24/2010 10:32	PAINT	1.35	mg / cm ^2	Final	DOOR fr	METAL	B	INTACT	RED	208	rc	Kitchen	1	1	0
51	6/24/2010 10:33	PAINT	3.12	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	Kitchen	5.57	1	0.02
52	6/24/2010 10:33	PAINT	3.58	mg / cm ^2	Final	WALL	PLASTER	C	INTACT	WHITE	208	rc	Kitchen	7.36	1	0.18
53	6/24/2010 10:34	PAINT	3.8	mg / cm ^2	Final	FLOOR	tile	C	INTACT	RED	208	rc	Kitchen	1.54	1	0
54	6/24/2010 10:35	PAINT	3.59	mg / cm ^2	Final	WALL	PLASTER	C	INTACT	WHITE	208	rc	bullpn	2.73	1	0.01
55	6/24/2010 10:36	PAINT	3.35	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	bullpn	1.51	1	0.04
56	6/24/2010 10:37	PAINT	1.34	mg / cm ^2	Final	Door fr	METAL	A	INTACT	WHITE	208	rc	bullpn	5.76	1	0.3
57	6/24/2010 10:37	PAINT	3.36	mg / cm ^2	Final	DOOR	METAL	A	INTACT	WHITE	208	rc	bullpn	6.93	1	0.3
58	6/24/2010 10:38	PAINT	1.57	mg / cm ^2	Final	DOOR	METAL	A	INTACT	WHITE	208	rc	chiefs office	1	1	0
59	6/24/2010 10:39	PAINT	1.34	mg / cm ^2	Final	DOOR fr	METAL	A	INTACT	WHITE	208	rc	chiefs office	1	1	0
60	6/24/2010 10:40	PAINT	3.36	mg / cm ^2	Final	WALL	PLASTER	D	INTACT	WHITE	208	rc	chiefs office	1.79	1	0
61	6/24/2010 10:40	PAINT	0.67	mg / cm ^2	Final	window sill	Tile	D	INTACT	WHITE	208	rc	chiefs office	1.75	1	11.8
62	6/24/2010 10:40	PAINT	0.68	mg / cm ^2	Final	window sill	Tile	D	INTACT	WHITE	208	rc	chiefs office	2.42	1	10.4
63	6/24/2010 10:41	PAINT	0.67	mg / cm ^2	Final	window sill	Tile	B	INTACT	RED	208	rc	chiefs office	1.8	1	12
64	6/24/2010 10:42	PAINT	1.35	mg / cm ^2	Final	DOOR	WOOD	A	INTACT	WHITE	208	rc	chiefs office	2.11	1	0.13

XRF Assay Results

Reading	Time	Type	Duration	Units	Sequence	Component	Substrate	Side	Condition	Color	Site	Inspector	Room	Depth	Action	PbC
65	6/24/2010 10:42	PAINT	1.35	mg / cm ^2	Final	DOOR fr	WOOD	A	INTACT	WHITE	208	rc	chiefs office	1.86	1	0.09
66	6/24/2010 10:43	PAINT	1.34	mg / cm ^2	Final	CABINET	WOOD	A	INTACT	BLUE	208	rc	chiefs office	3.2	1	0.18
67	6/24/2010 10:45	PAINT	2.91	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	dorm	3.21	1	0.03
68	6/24/2010 10:45	PAINT	2.7	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	dorm	7.5	1	0.04
69	6/24/2010 10:45	PAINT	3.13	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	dorm	4.62	1	0.05
70	6/24/2010 10:46	PAINT	0.9	mg / cm ^2	Final	WINDOW	tile	A	INTACT	RED	208	rc	dorm	1.82	1	11.7
71	6/24/2010 10:47	PAINT	1.33	mg / cm ^2	Final	DOOR	METAL	A	INTACT	RED	208	rc	Mens RR	1	1	0
72	6/24/2010 10:48	PAINT	3.13	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	Mens RR	1.13	1	0
73	6/24/2010 10:49	PAINT	0.89	mg / cm ^2	Final	Shower	tile	A	INTACT	TAN	208	rc	Womens RR	2.09	1	17.1
74	6/24/2010 10:50	PAINT	0.67	mg / cm ^2	Final	Shower	tile	A	INTACT	TAN	208	rc	Womens RR	2.01	1	17
75	6/24/2010 10:50	PAINT	0.9	mg / cm ^2	Final	Window Sill	tile	D	INTACT	RED	208	rc	Womens RR	1.88	1	14.3
76	6/24/2010 10:57	PAINT	4.04	mg / cm ^2	Final	calibration				RED	208	rc		1.21	1	1.1
77	6/24/2010 10:58	PAINT	20.34	mg / cm ^2	Final	calibration				RED	208	rc		1.13	1	1
78	6/24/2010 10:58	PAINT	2.69	mg / cm ^2	Final	calibration				RED	208	rc		1.12	1	0.9
79	6/24/2010 10:59	PAINT	20.33	mg / cm ^2	Final	calibration				RED	208	rc		1.09	1	1

CITY OF SAN DIEGO

MEMORANDUM

DATE: August 28, 2002

TO: Yousef Ibrahim, Associate Civil Engineer, Engineering and Capital Projects Department, Public Buildings and Parks Division

FROM: Jeff Jones, Asbestos & Lead Program Inspector, AJ
via Alan Johanns, Asbestos & Lead Program Manager, Environmental Services Department, Environmental Protection Division

SUBJECT: Fire Station #5 Lead and Asbestos Sample Results

Per your request, the Asbestos & Lead Management Program (ALMP) inspected Fire Station #5 for asbestos containing materials and non-intact lead containing paint. The following is a summary of the results.

Fire Station #5 Asbestos and Lead Sample Results

SAMPLE #	TYPE OF MATERIAL	LOCATION	CONDITION	ASBESTOS (%)	LEAD (mg/Kg)
5327-1A	wall plaster	bull pen	good	ND	-
5327-1B	wall plaster	battalion chief office	good	ND	-
5327-1C	wall plaster	dorm	good	ND	-
5327-2	black 9"x9" floor tile	bull pen	good	4%	-
5327-3	black floor tile mastic	bull pen	good	ND	-
5327-4	duct tape	roof ducts	good	ND	-
5327-5	duct mud	roof ducts	good	ND	-
5327-6	black mastic	roof ducts	good	6%	-
5327-7	black roof mastic	roof	good	5%	-
5327-8	silver paint	roof	good	ND	-
5050	1'x1' ceiling tile	bull pen	good	ND	-
7785	1'x1' ceiling tile	bull pen	good	ND	-
8138	1'x1' ceiling tile	bull pen	good	ND	-
2888-1	ceiling plaster	apparatus room	good	ND	-
2888-2	light gray speckled sheet vinyl	hallway, restroom	good	ND	-
2888-3	sheetrock	hallway by restroom	good	ND	-
2888-4	roof core	roof	good	ND	-

Painted surfaces that were found to be intact during a visual inspection do not require abatement prior to demolition, and therefore were not sampled. All paint inspected at this site was found to be intact.

Approximately 90 mercury containing fluorescent light bulbs and 45 PCB containing ballasts are present in this building. These must be removed prior to demolition.

The City's as-needed abatement contractor can perform all required abatement of asbestos materials, fluorescent light bulbs, and PCB ballasts. I will work with our abatement contractor to generate a quote for the removal.

This survey was nondestructive in nature and did not include materials concealed behind walls and hard ceilings. If suspect materials are found during the demolition process that are not mentioned in this report then work must stop until a determination of the material's asbestos status is made by ALMP.

Attached is language to be inserted into your specification that will identify to your general contractor what hazardous material the City will be abating prior to demolition.

Please contact me at 858-573-1277 with any questions regarding this report.

Jeff Jones
Asbestos & Lead Program Inspector

Attachment

memo2002\1183.

ENVIRONMENTAL SERVICES DEPARTMENT
ASBESTOS & LEAD MANAGEMENT PROGRAM
CUSTOMER SERVICE EVALUATION

Your comments regarding the service you have received from the Asbestos & Lead Management Program staff is important to us. Your feedback will assist us to maintain a quality of service which meets the City's needs. The time you take to complete this form is valuable to us and we do appreciate your appraisal of our services.

Please rate the service you received in the following areas:

	Unsatisfactory	Poor	Average	Good	Excellent
1. Timeliness of service	1	2	3	4	5
2. Courtesy of staff	1	2	3	4	5
3. Willingness of staff to go the extra step to satisfy your needs	1	2	3	4	5
4. Technical knowledge of staff	1	2	3	4	5
5. Projects completed within budget and time frame	1	2	3	4	5
6. Overall quality of service	1	2	3	4	5

What is one thing we could do to improve the service provided to you? _____

_____

_____

Please provide any additional comments. _____

_____

_____

Optional: If you would like us to contact you for follow-up service, to answer questions, or to discuss this survey, please print your name and phone number below.

NAME: _____ PHONE: _____

Please return to MS 1103-B or FAX to (858) 492-5089

THANK YOU FOR YOUR PARTICIPATION IN HELPING US PROVIDE THE BEST POSSIBLE QUALITY SERVICE (573-1262).

FY 2011

THE CITY OF SAN DIEGO

Historical Resources Board

September 28, 2012

City Of San Diego

Dear Owners:

Subject: Historical Resources Board Hearing of 9/27/2012

The City of San Diego Historical Resources Board held a noticed public hearing on 9/27/2012 to consider the historical site designation for the following property:

3902 NINTH AVENUE, SAN DIEGO, CA 92103
ASSESSOR PARCEL NUMBER: 444-690-16-00 AND 444-690-15-00

At the hearing the Board voted not to designate this property as a historical resource. In arriving at their decision, the Board considered the information submitted including the historical report prepared by the applicant, the staff report and recommendation, and all other materials submitted prior to and at the public hearing, including public testimony. Additionally, the members of the Board voting on the designation personally inspected the property prior to the hearing. **The action of the Board is final and is not subject to appeal.** If you have any questions, please feel free to call me at (619) 533-6301, or email me at santhony@sandiego.gov.

Sincerely,

S Anthony

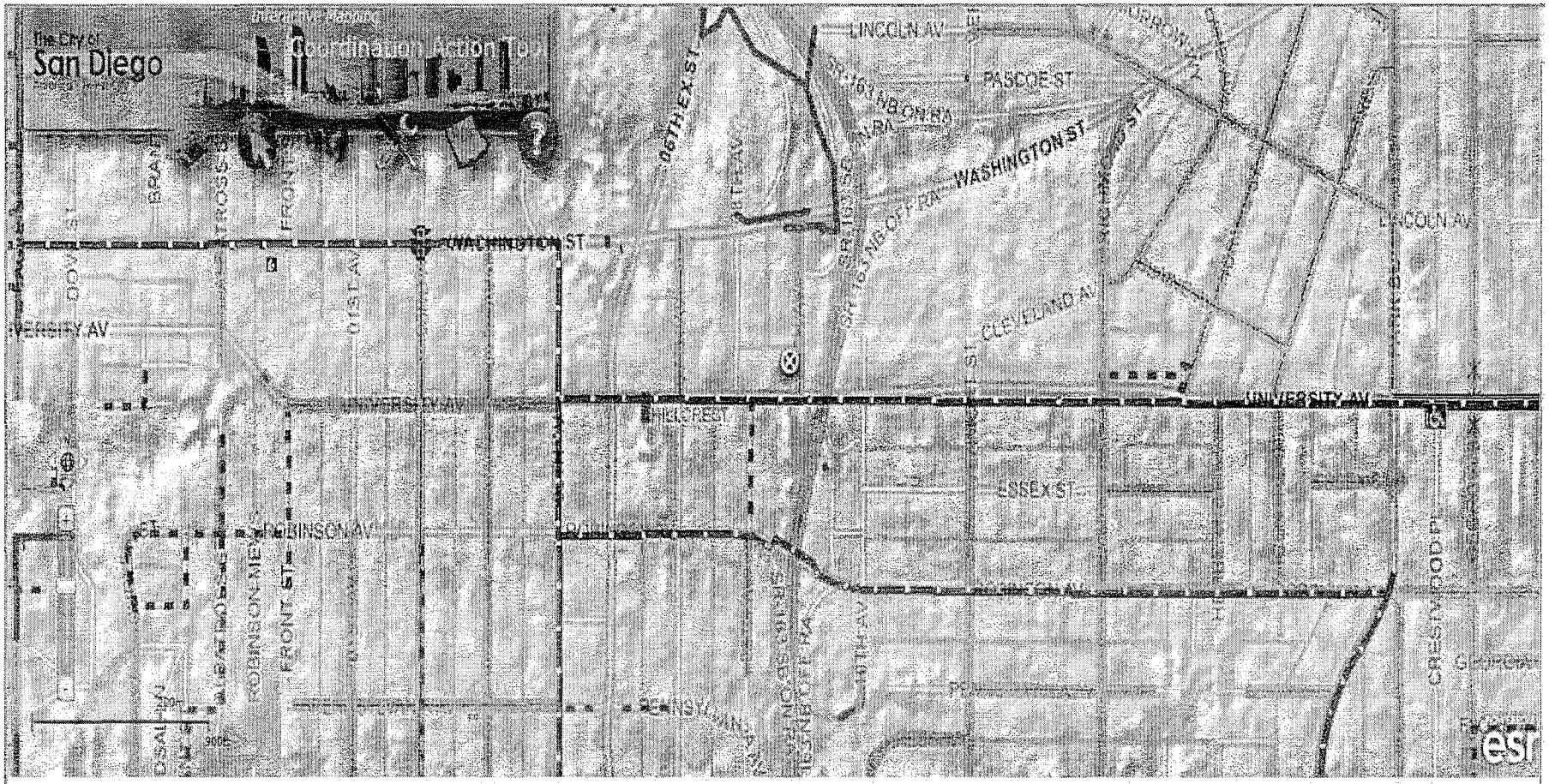
Shannon Anthony
Historical Resource Board Secretary

cc: Consultant
Council District
File

Development Services Department
1222 First Avenue, MS 512 • San Diego, CA 92101-4155
Tel (619) 235-5200 Fax (619) 446-5499

APPENDIX I

ADJACENT PROJECT CONFLICT WITH VICINITY OF FIRE STATION NO. 5



Update Selected | Update by SAP

Selected-ID	Selected Contact	Conflicting-ID	Conflict Contact	Title	Resolved	Comments	Resolved By	Date
S00788	Jadan, Rowaida	S11021	Bajoua, Mike	University Avenue Pipeline Replacement	☐			
S00687	Jadan, Rowaida	UU1	Mario Reyes	Briarwood Road	☐			
S00687	Jadan, Rowaida	UU446	Mario Reyes	Paradise Valley Road (Transmission)	☐			
S00687	Jadan, Rowaida	UU901	Mario Reyes	Residential Project Block 4AA	☐			
S00687	Jadan, Rowaida	813012	Huynh, Hung	Pipeline Rehabilitation U-1	☐			

APPENDIX J

NOTICE OF RIGHT TO APPEAL ENVIRONMENTAL DETERMINATION

THE CITY OF SAN DIEGO

Date of Notice: 2/12/13

NOTICE OF RIGHT TO APPEAL ENVIRONMENTAL DETERMINATION

DEVELOPMENT SERVICES DEPARTMENT
WBS# S-00688.02.06

PROJECT NAME/NUMBER: Fire Station 5/208885

COMMUNITY PLAN AREA: Uptown Community Plan

COUNCIL DISTRICT: 3

LOCATION: The project is located at 3902 Ninth Avenue in the Uptown Community Planning Area.

PROJECT DESCRIPTION: The project would demolish an existing 4,118 square-foot fire station and replace with a new two story 10,597 square-foot fire station with various site improvements on a .31 acre site. The station would house a crew of eight members and one battalion chief and accommodate one engine, one aerial truck and one battalion chief vehicle.

ENTITY CONSIDERING PROJECT APPROVAL: City of San Diego Development Services Department.

ENVIRONMENTAL DETERMINATION: CEQA Exemption 15302 (Replacement or Reconstruction)

ENTITY MAKING ENVIRONMENTAL DETERMINATION: Environmental Analysis Section, City of San Diego

STATEMENT SUPPORTING REASON FOR ENVIRONMENTAL DETERMINATION: Since the proposed fire station would be located on the same site as the existing fire station and would serve the same purpose and would not substantially expand capacity, the City of San Diego has determined the project meets the categorical exemption criteria set forth in the CEQA State Guidelines, Section 15302(c) [Replacement or Reconstruction]. The exemption allows for the replacement of existing structures and facilities where the new structure will be located on the same site as the structure replaced, and will have substantially the same purpose and capacity as the structure replaced and where the exceptions listed in Section 15300.2 would not apply.

DEVELOPMENT PROJECT MANAGER:	Angela Nazareno
MAILING ADDRESS:	1222 First Avenue, MS 301 San Diego, CA 92101
PHONE NUMBER:	619-446-5277

On 2/12/2013 the City of San Diego made the above-referenced environmental determination pursuant to the California Environmental Quality Act (CEQA). This determination is appealable to the City Council. If you have any questions about this determination, contact the City Development Project Manager listed above.

Applications to appeal CEQA determination made by staff (including the City Manager) to the City Council must be filed in the office of the City Clerk within 10 business days from the date of the posting of this Notice OR 15 business days from the date of the environmental determination, whichever occurs earlier. Applications to appeal CEQA determinations made by the Planning Commission from a Process Two or Three Appeal under SDMC section 112.0506 must be filed in the Office of the City Clerk within 10 business days from the date of the Planning Commission's decision. The appeal application can be obtained from the City Clerk, 202 'C' Street, Second Floor, San Diego, CA 92101.

This information will be made available in alternative formats upon request.

THE CITY OF SAN DIEGO

Date of Notice: February 3, 2016

NOTICE OF RIGHT TO APPEAL ENVIRONMENTAL DETERMINATION

DEVELOPMENT SERVICES DEPARTMENT
WBS No. S-00688.02.06

PROJECT NAME/NUMBER: Fire Station No. 5 Temporary Sprung Structure

COMMUNITY PLAN AREA: Uptown

COUNCIL DISTRICT: 3

LOCATION: 4311 Third Ave, San Diego, CA 92103

PROJECT DESCRIPTION: DESCRIPTION OF NATURE, PURPOSE, AND BENEFICIARIES OF PROJECT: Installation of a 40' x 60' sprung structure that will temporarily house Fire Department vehicles, including a fire engine/truck. The 2,400 SF sprung structure will be installed in an existing asphalt parking lot located on the property of 4311 Third Ave. The sprung structure has an architectural membrane consisting of a tensioned fabric and is supported with structural members. The sprung structure will be anchored by earth anchor with an ¾ inch diameter by five feet long at each of the 14 columns. The sprung structure is intended for temporary use until a permanent facility is identified and operational. The asphalt parking lot in which it will be installed will be restored back to its existing condition through patch work. Under a separate transaction, the Fire Department will be leasing an adjacent building to house firefighters which, in combination with the sprung structure, would function as a temporary Fire Station No. 5. The project is within the Uptown Community Planning Area in City Council District 3.

ENTITY CONSIDERING PROJECT APPROVAL: City of San Diego

ENVIRONMENTAL DETERMINATION: Categorically exempt from CEQA pursuant to CEQA State Guidelines Sections 15303 (New Construction or Conversion of Small Structures) and 15304 (Minor Alterations to Land).

ENTITY MAKING ENVIRONMENTAL DETERMINATION: City of San Diego Development Services Department

STATEMENT SUPPORTING REASON FOR ENVIRONMENTAL DETERMINATION: 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 15303 (New construction or conversion of small structures), which allows the construction of accessory structures, including

garages, carports, etc.; and Section 15304 (Minor alterations to land), which allows for the minor temporary use of land having negligible or no effects on the environment, and where the exceptions listed in Section 15300.2 would not apply.

CITY PROJECT MANAGER:	Rowaida Jadan, Project Manager
MAILING ADDRESS:	525 B Street, Suite 750, San Diego, CA 92101 San Diego, CA 92101
PHONE NUMBER:	(619) 533-6655

On February 3, 2016, the City of San Diego made the above-referenced environmental determination pursuant to the California Environmental Quality Act (CEQA). This determination is appealable to the City Council. If you have any questions about this project, contact the City Project Manager listed above.

Applications to appeal CEQA determination made by staff to the City Council must be filed in the office of the City Clerk within 10 business days from the date of the posting of this Notice (February 18, 2016). The appeal application can be obtained from the City Clerk, 202 'C' Street, Second Floor, San Diego, CA 92101.

This information will be made available in alternative formats upon request.

APPENDIX K

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

February 1, 2016

FIRE STATION NO. 5

CITY OF SAN DIEGO
San Diego, California

buildingSMARTalliance

Please consider the environment before printing this document

Rob Wellington Quigley, FAIA
416 Thirteenth Street San Diego, California 92101 Telephone: 619-232-0888

USER GUIDE FOR THE PROJECT MANUAL 00 01 08

1. SUMMARY:

A. GENERAL: This Guide is provided as a basis for understanding the organization and use of this Project Manual.

B. DEFINITIONS:

1. Construction Documents: Defined as the written and graphic documents prepared or assembled by the City Representative for communicating the design of the project and administering the contract for its construction. These include the Procurement Requirements (Advertisement for Bids, Instructions to Bidders, and Bid Forms) and the Contract Documents.
2. Contract Documents: Defined as the legally enforceable requirements that become part of the contract when the agreement is signed, these include the Contract Forms, Conditions of the Contract, Specifications, Drawings, Addenda, and Contract Modifications. They describe the proposed construction (referred to as the "Work") that results from performing services, furnishing labor, and supplying and incorporating materials and equipment into the construction.
3. Contract Forms: Include the agreement, bonds and certificates.
4. Conditions of the Contract: Define the basic rights, responsibilities, and relationships of the parties involved in the construction process.
5. Specifications: Divided into 50 Divisions, the Specifications define the qualitative requirements for products, materials, and systems and the standards of workmanship required for installation. Division 01 sections constitute the GENERAL REQUIREMENTS necessary for the Project; Divisions 02 through 49 comprise the Technical Specifications portion of the Project Manual.
6. Drawings: Graphic representations of the Work, which show the materials and their relationships to one another, including sizes, shapes, fit, location, and connections.
7. Addenda: Written or graphic documents issued to clarify, revise, add to, or delete information in the original bidding documents or in previous addenda.
8. Contract Modifications: Written instruments used to add to, delete from or otherwise modify the Work after the construction agreement has been signed.

C. DIVISION 01 - GENERAL REQUIREMENTS: Division 01 of the Specifications expands on certain of the broad provisions of the Conditions of the Contract and governs the execution of all Technical Sections of the Specifications. Sections included in Division 01 specify the administrative and procedural requirements, as well as temporary facilities, required for the Project. All requirements stated in Division 01 apply to and will be in force for all subsequent Sections included in Divisions 02 through 49.

D. PRODUCT REFERENCES: Specification Section numbers and titles follow the latest recommendations of MasterFormat™ 2014 Edition published by the Construction Specifications Institute (CSI). The Section titles represent work results and may be stated in the singular or plural without regard to the actual quantity used on the project. The organization of specifications by Section is not meant to define subcontracts or other divisions of work by trades.

E. MANUAL FORMAT:

1. General: The first page of each Section is graphically defined with very large and boldfaced Section number and title. Succeeding pages of each Section are printed back-to-back, with header in normal-sized type that has the Section name and number and page number appearing in the upper right-hand corner of the page.
2. Underlined and Boldface Type: Underlining and bolding have been used in different combinations throughout the Project Manual to highlight headings and significant text. These devices have been used to assist the user in finding items of information or to emphasize the importance of certain information. No other meaning is attached to the use of boldface and underlined text.
3. Dates: The official date of issue of the Project Manual appears on the cover sheet of this Project Manual. Dates subsequent to that date on individual Section pages indicate reissue of entire Sections for clarification.

1.2 DEFINITIONS AND INTERPRETATIONS:

A. WORDS AND TERMS: Those which are frequently used, with special meanings, in this Project Manual are defined in Section 01 42 00 - REFERENCES.

B. GOVERNING DICTIONARY: The definitions of words used in these Specifications, which are not defined in Section 01 42 00 - REFERENCES, the General Conditions, or in referenced standards, are as given in "The American Heritage Dictionary of the English Language".

C. SPECIFICATION LANGUAGE: These Specifications are written in the imperative mood, as defined in the Construction Specifications Institute's Project Delivery Practice Guide. Imperative language is directed to the Contractor. The indicative mood is employed on occasion when such sentence structure is necessary to convey the intended meaning in a more accurate or understandable form. The text is streamlined, with the colon (:) employed as a symbol for the words "shall be", "shall have", "shall conform with", "shall comply with", or "shall meet the requirements of". The colon is also used to separate a paragraph title or heading from the text that follows.

* * *

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N/A

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N/A

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DIVISIONS 34 to 49 - NOT USED
N/A

* End 00 01 10 *

Division 01 - GENERAL REQUIREMENTS

SUMMARY OF WORK Section 01 01 50

1. GENERAL:

A. THE PROJECT: The name of the Project is Fire Station No. 5. The project site is located at 3902 Ninth Avenue, San Diego, CA 92103.

B. RESPONSIBLE PARTIES: Construction of this Project is governed by the agreement between the City and the Contractor. Statements in the specifications are directed to this contractor, who has overall responsibility for the subcontractors.

C. COMMUNICATIONS: Written or graphic communications during construction shall be documented using the PDF technology of Adobe Acrobat Standard 6.0 or greater.

D. WORK COVERED BY THE CONTRACT DOCUMENTS:

1. General: Under a single contract construct new 10,597-square foot, two-story fire station in conformance with Drawings and Specifications prepared by Rob Wellington Quigley, FAIA, Architects, San Diego, CA, and bound herewith.
2. Scope of Work: Work includes demolition of the existing Fire Station, located at 3902 Ninth Ave, and construction of a new station on the site; construction of a temporary fire station, located at 4311 3rd Avenue, San Diego to relocate fire crew until the construction of the new station is complete; and repaving of the alley adjacent to the station to accommodate the fire trucks' loads. Work also includes returning the temporary fire station site to its original condition upon completion, replacing the trellis and repaving the parking lot, and moving the dismantled temporary structure to a location as directed by the City Representative.

E. REQUIREMENTS:

1. Requirements for Sequencing or Scheduling:
   a. General: Begin work as identified in the Construction Contract, proceed as shown in the Progress Schedule as required under Section 01 32 14 - Progress Schedule, and complete work within the limits designated in the Construction Contract. Refer to General Provisions.
   b. Schedule of Work: Coordinate work to accommodate the City's operations and use of premises during construction period; coordinate construction schedule and operations with City's Representative; indicate all special requirements in the Progress Schedule as specified.
2. Owner-Furnished, Contractor-Installed Items: Existing equipment will be provided for installation, including work bench and lockers.

2. PRODUCTS:

A. HAZARDOUS MATERIALS:

1. General: No asbestos or products containing asbestos have been knowingly specified for this Project.
2. Notification: If materials containing asbestos are brought to the site for use or installation in the Work; or if such materials are encountered in existing work upon which new work is being performed, notify the City immediately so that appropriate action may be taken.
3. Certification: A statement certifying that no new materials containing asbestos have been included in the Work is required at the completion of the Project.

3. EXECUTION:

A. CONTRACTOR'S USE OF PREMISES:

1. General: Confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents; do not unreasonably encumber the site with materials or equipment.
2. Access to Site: Roads for access to and from building site, loading areas and parking space shall be as indicated. Confine traffic and materials delivery to these roads and locations.
3. Storage: Contractor is responsible for protection and safekeeping of products stored on the site. Specific areas for storage of materials and site fabrication shall be as indicated by the City.

B. PROTECTION: Erect temporary barricades, warning signs and substantial handrails to protect persons in and around the work areas and observe safety precautions. Conform to applicable OSHA rules and regulations and State Safety Regulations and Orders.

* * *

MEASUREMENT AND PAYMENT Section 01 02 50

1. GENERAL:

A. DESCRIPTION:

1. This section defines the Lump Sum Prices and Allowances listed in the Bid Schedule, and the manner in which they will be used to determine measurement and payment for all items included in the Bid Schedule. Parts 2 and 3 of this section describe the procedures required to be followed for monthly progress payments to the CONTRACTOR.
2. Payment for all items of the Bid Schedule whether lump sum or unit price shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of WORK being described, as necessary to complete the various items of the WORK all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs shall be included in the prices named in the Bid Schedule for the various items of WORK.
3. Monthly pay requests are due on the 6th of each month, and while pay requests will be accepted prior to this date, pay request processing will not begin until this date for purposes of meeting the City's pay request processing obligations under the California Public Contract Code. Failure of the CONTRACTOR to submit his pay request by this day may be cause for the rejection of the pay request. If rejected, the CONTRACTOR may have to resubmit his pay request the next month. Should the submittal date fall on a holiday or weekend day during the month then the CONTRACTOR shall consider the next working day as the due date.

B. BID PROPOSAL:

1. Lump Sum Prices: The CONTRACTOR shall provide Lump Sum Prices in the Bid Schedule for all WORK in the Contract Documents, except items of WORK listed in the Contract as Unit Priced Items. For Lump Sum items, only the total amount need be filled in.
2. Allowance Items: Allowance Item amounts are provided by the CITY to cover the cost of additive WORK not presently identified in the Contract Documents. Payment for Allowance Items will be made only when authorized as described in Part 1.C, below.
3. Retention: Payment for all bid items is subject to the retention provisions of the General Conditions.
4. Schedule: All scoped Allowance Bid Items and Unit Priced Bid Items are included in the scope of the Contract without specific locations for the WORK provided. The CITY reserves the right to direct that these scoped items of WORK be performed when they are encountered, and the CONTRACTOR is obligated to accommodate this WORK within the original contract duration. The CONTRACTOR will not be entitled to additional time regardless of where the WORK is encountered.
5. Quantities for each item in the Bid Schedule will be used to analyze the bids and determine contract award.
6. Specified Items and Stipulated Prices: The stipulated price for these items cannot be invoiced until the item is complete and accepted by the CITY REPRESENTATIVE.

C. MEASUREMENT AND PAYMENT:

1. General: This article defines the manner and method to develop the Lump Sum and Allowance bid amounts of all items identified in the Bid Schedule. Bid amounts will include all plant, equipment, tools materials, labor, service, and all other items required to complete the WORK included in the Contract unless specifically excluded by this section. WORK required for which no separate bid item is identified will be considered as a subsidiary obligation of the CONTRACTOR, and the cost therefore shall be included in the most applicable bid item. Compensation for completion of the WORK will be determined by use of the cost loaded CPM schedule. Bid amounts for each item will be the basis for development of budget values for activities included in the cost loaded CPM schedule as described in the Contract Documents. Allowance Bid Item amounts will also be adjusted by a Change Order to the contract amount when WORK is completed, and actual authorized quantities and Allowance amounts are established.

2. Contract-Required WORK:
   a. Bid Item No. 1 - Construction of Fire Station No. 5 and related site improvements. (Lump Sum): The lump sum payment for the demolition of the existing Fire Station at 3902 Ninth Avenue, San Diego, California 92103, and Construction of the new Fire Station No. 5 and related site improvements shall be considered full compensation for furnishing, constructing and completion of all facilities, demobilization, insurance, supervision, planning, design, and engineering fees, complete as defined within these Contract Documents.
   b. Bid Item No. 2 - Construction of Temporary Fire Station No. 5 and related site improvements. (Lump Sum):
      1. Description: The Construction of Temporary Fire Station No. 5 at 4311 3rd Avenue, San Diego California 92103, and related site improvements including furnishing, constructing and completion of all facilities, demobilization, insurance, supervision, planning, design, and engineering fees, complete as defined in Section 13 34 23 - TEMPORARY FIRE STATION, within these Contract Documents.
      2. (Lump Sum):
   c. Bid Item No. 3 –Building Permits (Allowance):
      1. General: Refer to City Supplement section 7-5, "Permit, Fees, and Notices."
      2. Description: Building Permits for the Permanent and Temporary Fire Stations, including mechanical, plumbing and electrical, fees related to the Fuel Tank Permit, and including the City of San Diego Water and Sewer Capacities and Connection Fees. Payment for the Building Permit Allowance will be based on the actual expenditures and for pre-authorized items of the Work in accordance with the Contract Documents. The unused portions of the allowance will revert to the City upon Acceptance.
         No measurement will be made for this item. Payment for Work under this bid item will be made only to the extent that such Work is specifically authorized in advance by the CITY REPRESENTATIVE.
      3. Allowance Amount: $100,000.00.
   d. Bid Item No. 4 - Photovoltaic Panels at Roof Installation - (Allowance):
      1. Description: Furnish, install, connect, test and make operational the photovoltaic panels at roof installation as shown and as specified in Section 26 31 01 - PHOTOVOLTAIC SYSTEM.
      2. Allowance Amount: $100,000.00.
   e. Bid Item No. 5 – SDG&E Service Fee, Dry Utilities Connections (Allowance):
      1. General: Payment for the SDG&E Service Fee, dry utilities connections, Pacific Bell, A.T.&T. and Time Warner Allowance will be based on the actual expenditures and for pre-authorized items of the Work in accordance with the Contract Documents. The unused portions of the allowance will revert to the City upon Acceptance.
         No measurement will be made for this item. Payment for Work under this bid item will be made only to the extent that such Work is specifically authorized in advance by the Engineer.
      2. Allowance Amount: $59,101.00.
   f. Bid Item No. 6 - Water Pollution Control Program Development (Lump Sum): Refer to City Supplement section 701-13.9.5.
   g. Bid Item No. 7 - Water Pollution Control Program Implementation (Lump Sum): Refer to City Supplement section 701-13.9.5.
   h. Bid Item No. 8 – Furniture, Fixtures and Equipment (Allowance):
      1. General: No measurement will be made for this item. Payment for WORK under this bid item will be made only to the extent that such WORK is specifically authorized in advance by the Engineer.
         Prices for this WORK will be negotiated. This item is considered incidental to the Contract and may be adjusted or deleted in its entirety.
      2. Allowance Amount: $120,000.00.
   i. Bid Item No. 9 – Bonds (Lump Sum):
      1. General: Refer to the GREENBOOK and City Supplement section 2-4, "Contract Bonds."
      2. Description: The Bid item for bonds includes full compensation for actual costs of payment and performance bonds. You may submit a request for payment of actual invoiced costs up to the bid amount, but not to exceed 2.5% of the Contract Price, not less than 10 Working Days after Award of Contract.
         If the Bid item for bonds exceeds actual invoiced costs, any such differential amount up to the bid amount, must be paid as a part of the Final Payment.
      3. (Lump Sum):
   j. Bid Item No. 10 – Field Orders - (Allowance):
      1. General: Refer to City Supplement section 9-3.5.

2. No measurement will be made for this item. Payment for WORK under this bid item will be made only to the extent that such WORK is specifically authorized in advance by the Engineer.
   Determining the price for miscellaneous field orders will be done in accordance with the Contract Document provisions.
3. Allowance Amount: $335,000.00.

2. PRODUCTS:

A. GENERAL PROGRESS PAYMENT REQUIREMENTS:
   1. Payment for WORK performed shall be in accordance with the Cost Loaded CPM. The CITY REPRESENTATIVE will verify measurements and quantities. Each activity necessary to manage and complete the WORK is identified on the contract schedules. Each activity will be assigned its respective value, a portion of the contract price, as shown on the Summary of Values.
   2. Payment for all lump sum costs and services incurred on this Contract shall be based on the earned value of WORK accomplished during the reporting period. Earned value is determined by the completion percentage of each activity applied to the total value of the activity. No construction activity shall be deemed 100% complete until the CONTRACTOR has completed the physical check out and inspection of the completed WORK and has submitted the signed inspection form to the CITY REPRESENTATIVE.
   3. Unit price items will be paid based on quantities (or equivalent quantities) installed.
   4. Earned value is derived from the current status of the CONTRACTOR Construction Schedule as determined by the monthly schedule status submittals. Each schedule status submittal is reviewed and approved by the CITY REPRESENTATIVE prior to the CONTRACTOR obtaining approval for the Summary of Earned Values or quantities installed and the Application for Payment.
   5. The CONTRACTOR shall not take advantage of any apparent error or omission on the Drawings or Specifications, and the CITY REPRESENTATIVE shall be permitted to make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents at no additional cost to the CITY.
   6. The retainage specified in the contract shall apply to all payments to the CONTRACTOR including permits and mobilization.

B. APPLICATION FOR PAYMENT:
   1. Application for payment shall be on the CITY's form provided by the CITY REPRESENTATIVE and certified by signature of an Authorized Officer of the CONTRACTOR. Three (3) copies of the application for payment shall be submitted. Application shall be made monthly.
   2. The Application for Payment contains all necessary references and attachments that substantiate the invoice for progress payment, (e.g., certified payrolls, labor reports, progress schedule data, and Summary of Earned Values). It must be preceded or accompanied by schedule and status data in accordance with the Contract Document provisions.
   3. The Application for Payment is submitted according to the format and instructions provided by the CITY and covering the WORK completed through the last day of the previous month or through the date established by the CITY REPRESENTATIVE.

3. EXECUTION:

A. MONTHLY REVIEWS/APPLICATION FOR PAYMENT:
   1. Monthly review meetings between the CONTRACTOR and the CITY REPRESENTATIVE will be held within 7 days prior to the payment application date designated by the CITY REPRESENTATIVE. Prior to the monthly review meeting, the CONTRACTOR will submit the Master Record Documents as identified in the Contract Document provisions, an updated schedule and a signed application for payment showing a Summary of Earned Values for the reporting and payment period so that the CITY REPRESENTATIVE can compare earned values to available status data. The CONTRACTOR shall make any adjustments to the Master Record Documents, updated schedule, and payment applications deemed necessary. Upon completion of the adjustments the CITY REPRESENTATIVE will sign the payment request and forward it to the CITY. The CITY REPRESENTATIVE will determine payment amounts if agreement with the CONTRACTOR is not reached.

B. PAYMENT FOR PRODUCTS STORED ON SITE:
   1. Refer to City Supplement section 9-3.3.1.1.
   2. The CONTRACTOR may request payment for products (material and/or equipment) which will be incorporated into the WORK and which are delivered and stored on-site. Payments for products stored at the site shall be based upon the cost of all acceptable materials and equipment not incorporated in the WORK but delivered and suitably stored at the site; provided each such individual item has a value of more than $5000 and will become a

permanent part of the WORK. The Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that the CONTRACTOR has received the materials and equipment free and clear of all liens, charges, secured interests, and encumbrances and evidence that the materials and equipment are covered by appropriate property insurance as specified in the insurance provisions and other arrangements to protect the CITY'S interest.

C. PARTIAL PAYMENTS FOR MATERIALS STORED OFF SITE:
   1. Refer to City Supplement section 9-3.3.1.2.
   2. The CONTRACTOR may request partial payment for Products (material and/or equipment), which will be incorporated into the WORK and which are delivered and stored off-site. Any payments approved pursuant to this sub-section shall not exceed sixty-five percent (65%) of the Product's invoiced value and shall be subject to retainage as set forth in the General Conditions. The CITY reserves the right to refuse approval for payment for any Equipment or Materials suitably stored off-site in its sole discretion, regardless of whether all conditions contained herein have been met.
   3. Partial payment may be made for Products eligible for off-site delivery and storage only upon presentation by the CONTRACTOR of a Bill of Sale, an Invoice or an Affidavit certifying that the material is received by the CONTRACTOR free and clear of all liens, encumbrances and secured interests of any kind, and including, for off-site delivery, evidence acceptable to the CITY that "all-risks" property insurance in an amount sufficient to protect the interests of the CITY is in effect at the approved site, and that the CITY is a loss payee and an additional insured.
   4. Partial payment for Products delivered and stored off-site shall be contingent upon CONTRACTOR'S compliance with the storage and protective maintenance requirements set forth in the Contract Document provisions and all other requirements necessary to preserve equipment warranties for the benefit of the CITY.
   5. All costs associated with delivery to and storage at an off-site facility shall be assumed by the CONTRACTOR notwithstanding the CONTRACTOR'S request for and the obtaining from the CITY approval to so deliver and store the materials.
   6. CONTRACTOR shall provide written evidence to the CITY of having made arrangements for unrestricted access by the CITY and its authorized representatives to the materials wherever stored, including provision for the CITY to take control and possession of such materials at any time and without restriction.
   7. CONTRACTOR must provide the CITY, upon request and prior to any partial payment, documentation which transfers absolute legal title to such materials to the CITY conditional only upon receipt of final payment. Neither such transfer of title nor any partial payment shall constitute acceptance by the CITY of the materials, nor void the right to reject materials subsequently found to be unsatisfactory, or in any way relieve the CONTRACTOR of any obligation arising under the Contract Documents.

* * *

SUBSTITUTION PROCEDURES Section 01 25 00

1. GENERAL:

A. SUMMARY: This Section includes administrative and procedural requirements for handling requests for substitutions. Refer also to General Provisions.
   1. Definitions:
      a. General: Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.
      b. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents that are proposed by the Contractor after award of the Contract are considered to be requests for substitutions.

B. PRODUCT OPTIONS: Refer to Section 01 60 00 - PRODUCT REQUIREMENTS.

C. SUBMITTALS:
   1. Products List: Include products for which Contractor proposes a substitution in the Products List submitted under Section 01 60 00 - PRODUCT REQUIREMENTS.
   2. Substitutions:
      a. General: For any request for "approved equal" or substitution, submit one (1) electronic copy (PDF) of completed and signed Substitution Request with required substantiating data.
      b. Substantiating Data:
         1. Required Information: Provide product identification; manufacturer's name and address; manufacturer's literature including product description, performance and test data and all reference standards; samples; and name and address of similar projects using the product, including dates of installation and names of Architect and Owner.
         2. Data Comparison: Submit a side-by-side, item-by-item comparison of all characteristics of the specified product and the proposed product.
         3. Construction Schedule: Provide statement of effect of substitution on construction schedule.
         4. Cost Comparison: Submit cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
   3. City's Action: If necessary, the City will request additional information or documentation for evaluation within one (1) week of receipt of a request for substitution. The City will notify the Contractor of acceptance or rejection of the substitution in accordance with the General Provisions.
   4. Distribution: Accepted substitution requests will be distributed as electronic copy (PDF) to the Architect, City, and Contractor.

D. COORDINATION: City's acceptance of product as "equal" or as a substitution does not relieve Contractor from responsibility for compliance with requirements of any portion of Contract Documents; Contractor shall be responsible, at Contractor's own expense, for any changes in other parts of the Work which may be caused by such substitution.

2. PRODUCTS:

NOT USED

3. EXECUTION:

NOT USED

* * *

CONTRACT MODIFICATION PROCEDURES Section 01 26 00

1. GENERAL:

A. DESCRIPTION: Requirements for documentation of changes in the Work, as defined in the General Provisions.

B. CHANGE PROCEDURES:

1. Authorized Agent: Submit to City the name of the individual authorized to receive change documents and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
2. Proposal Request: City may issue a Proposal Request which includes a detailed description of a proposed change in the Work. Contractor will prepare and submit an estimate within ten (10) days.
3. Request for Change: Contractor may propose a change by submitting a written request to the City, describing the proposed change and its full effect on the Work; include a statement describing the reason for the change, the effect on the Contract Sum/Price and Contract Time with full documentation, and a statement describing the effect on work by separate or other contractors. Document any requested substitutions in accordance with Section 01 25 00 - SUBSTITUTION PROCEDURES.
4. Distribution of Completed Documents: Completed Change Orders and Construction Change Directives will be in PDF form.

C. CHANGE ORDERS:

1. Format: Issued by City to order changes to the work which involve a change in Contract Price and/or Contract Time.
2. Documentation of Change in Contract Price And/or Contract Time:
   a. General: Maintain detailed records of work done on a time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.
   b. Quotation Breakdown: Itemize each quotation for a change in cost or time in sufficient detail to allow evaluation of the quotation. As a minimum, itemize separately each significant material and equipment purchase and the work of each trade and subcontractor.
   c. Supporting Data:
      1. Costs: Separate costs for products, labor, equipment, and subcontractor quotations.
      2. Quantities: Products, labor, and equipment.
      3. Taxes, Insurance and Bonds: As required.
      4. Overhead and Profit: As required.
      5. Justification: Change in Contract Time.
      6. Credit: For deletions from Contract, similarly documented.
      7. Additional Data: On request, as required to support computations.
   d. Claim for Additional Costs:
      1. General: Support each claim for additional costs, and for work done on a time and material basis, with the following additional information:
      2. Origin and Date of Claim: State name and originator and date.
      3. Dates and Times: When work was performed and by whom.
      4. Time Records and Wage Rates: As recorded and paid.
      5. Invoices and Receipts: For products, equipment, and subcontracts, similarly documented.
3. Execution of Change Orders: City will issue Change Orders for signatures of parties as provided in the General Provisions.

D. CONSTRUCTION CHANGE DIRECTIVE: Issued to instruct the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. The document will describe changes in the Work, and will designate method of determining any change in Contract Price or Contract Time. Promptly execute the change in Work.

2. PRODUCTS:

A. TYPES OF CHANGE ORDERS:

1. Stipulated Price Change Order: Based on Proposal Request and Contractor's maximum price quotation or Contractor's request for a Change Order approved by City.
2. Unit Price Change Order:
   a. General: For unit costs or quantities of units of work which are not pre-determined, execute Work under a Construction Change Directive.
   b. Pre-determined Unit Prices and Quantities: Change Order will be executed on a fixed unit price basis.
   c. Changes in Contract Price or Contract Time: Computed as specified for Time and

Material Change Order.

3. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. City will determine the change allowable in Contract Price and/or Contract Time as provided in the Contract Documents. Maintain detailed records of work done on time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

3. EXECUTION:

A. CORRELATION OF CONTRACTOR SUBMITTALS:

1. General: Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum/Price.
2. Progress Schedule: Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust time for other items of work affected by the change, and resubmit.
3. Record Documents: Record authorized changes in Project Record Documents.

* * *

INFORMATION REQUEST PROCEDURE Section 01 26 31

1. GENERAL:

A. DESCRIPTION: Submit request for information, interpretation and/or clarification to the City promptly upon identification of need, and in reasonable time so as not to affect the progress of the Work.

B. SUBMISSION PROCEDURES:

1. General: Request for information beyond that set forth in the Contract Documents will be considered only when the request is in writing and fully documented.
2. Time: Identify and submit requests for information in a timely manner.
3. Pre-submission Review: Before submitting request to the City, Contractor shall conduct a review to determine that the information requested, including items submitted by subcontractors or suppliers, is not shown in the Contract Documents.
4. Category of Request:
   a. General: Submit requests for information when one or more of the following conditions occur:
   b. Need for Clarification: When information shown or indicated in the Contract Documents is unclear in its intent.
   c. Unforeseen Condition: Discovery of unforeseen condition or circumstance that is not shown or indicated in the Contract Documents.
   d. Conflict Within Documents: Discovery of an apparent inconsistency, conflict or discrepancy between different portions of the Contract Documents, where the intent cannot be reasonably inferred from information shown or indicated.
   e. Omission: Discovery of what appears to be an omission in the Contract Documents, where the intent cannot be reasonably inferred from information shown or indicated.
   f. Coordination Problem: Discovery of unforeseen condition in coordinating placement of work that is specifically related to the Contract Documents.
5. Unacceptable Requests:
   a. General: Do not submit requests for information for confirmation of any action already taken by the Contractor. Requests will not be accepted that imply confirmation of any unauthorized change to the Work.
   b. Untimely Submission: A request for information that is submitted in a belated manner without proper coordination and scheduling of the Work of related subcontractors will not be reviewed and will be returned to the Contractor.
   c. Submittal: A request for information that is included as part of a submittal will not be processed; see Section 01 33 10 - SUBMITTALS.
   d. Substitution: A request for information that is a request for substitution will not be processed; see Section 01 25 00 - SUBSTITUTION PROCEDURES.
   e. Exclusionary Submission: A request that implies that specific portions of the work are assumed to be excluded or considering a separate portion of the Contract Documents in part rather than as a whole will not be processed.
6. Log: Contractor shall prepare and maintain the official log of requests for information. Review status of log at each job progress meeting.

2. PRODUCTS:

A. SUBMISSION REQUIREMENTS:

1. Request for Information (RFI) Form:
   a. General: Provide a completed and legible PDF of the RFI Form with each submittal.
   b. RFI Number: Identify RFIs sequentially starting from number one (1); number re-submissions with same number as original and add letter designation A., B., C., etc., in order submitted, until resolution is achieved.
   c. Contractor: Provide company name and mailing address with signature of contact person responsible for work on this Project, certifying to review of RFI.
   d. Subcontractor and/or Supplier: Provide company name, mailing address, telephone number and name and email of contact person responsible for work on this Project.
   e. RFI Description:
      1. General: Describe subject of RFI completely.
      2. Specifications References: Identify specification section number and paragraph number under consideration.
      3. Drawing References: Identify specific drawing number and/or detail number under consideration.
      4. Attachments: Identify as required, to support description.
   f. Contractor's Proposed Resolution:
      1. General: Describe suggested resolution; support with attachments as required.

2. Cost Impact: Indicate impact on costs; explain Contractor's original basis for bid and, based on the current request, reason that additional costs should be considered.
3. Time Impact: Indicate effect on schedule; explain Contractor's original basis for bid and, based on the current request, why a time extension should be considered.

3. EXECUTION:

A. CITY'S RESPONSE:
   1. General: City will respond on the RFI Form in accordance with the General Provisions and include attachments, as referenced. Verbal responses to such requests are to be considered informational; official written response will only be given on annotated PDF of original RFI Form.

B. DISTRIBUTION:
   1. General: Submit PDF of original, signed copy. PDF with the official response will be returned to the Contractor.
   2. Consultants: The City will distribute copies of requests for information to project consultants, as required for their participation. Direct communication and response between project consultants and Contractor will be considered informational only.
   3. Response: The Contractor will make and distribute copies of the official response to subcontractors and suppliers, as required.

* * *

PROJECT MANAGEMENT & COORDINATION Section 01 31 00

1. GENERAL:

A. SUMMARY: Coordinate scheduling, submittals, and Work of the various sections of these Specifications to assure the efficient and orderly sequence of installation of each part of the Work. Coordinate construction operations included under different sections that depend on each other for proper installation, connection, and operation.

B. SUBMITTALS:
   1. General: Within seven (7) calendar days of receipt of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the superintendent and other key personnel in attendance at the Project Site. Identify each individual by name, title, and provide a description of their duties and responsibilities. Update list within seven (7) calendar days of any staff change.
   2. Communications: Submit written procedures for Project communications including submittals, reports and records, schedules, coordination drawings, and recommendations.
   3. Coordination Drawings: Submit as required under Section 01 33 10 - SUBMITTALS. Prepare where careful coordination is required for installation of products and materials fabricated by separate entities and/or where limited space availability requires maximum utilization of space for efficient installation of different components. Show the relationship of components and required installation sequences.

C. SCHEDULING:
   1. General: Refer to Section 01 32 14 - PROGRESS SCHEDULE.
   2. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures such as preparation of schedules, installation and removal of temporary facilities, delivery and processing of submittals, progress meetings, and Project closeout activities, with other construction activities to avoid conflicts and assure orderly progress of the Work.

D. MEETINGS:
   1. General: Schedule and administer meetings throughout progress of the Work at biweekly intervals.
   2. Duties: Schedule meetings, prepare agenda with copies for participants, preside at meetings, and distribute copies of minutes within two (2) days of receipt from the City's Representative to the participants and those affected by decisions made.
   3. Attendance Required: Job superintendent, major subcontractors and suppliers, and the Architect, as appropriate to agenda topics for each meeting.
   4. Agenda: Include review of minutes of previous meeting; review of Work progress; field observations; problems and decisions; review of submittals schedule and status of submittals; review of off-site fabrication and delivery schedules; maintenance of progress schedules; corrective measures to regain projected schedules; planned progress for succeeding work period; projected progress of coordination; maintenance of quality of work standards; effect of proposed changes on progress schedule and coordination; other business relating to Work.

E. CONSTRUCTION MOBILIZATION: Coordinate the use of the site and facilities. Allocate mobilization areas of site; allow for field offices and sheds, access, traffic, and parking facilities.

2. PRODUCTS:

A. MATERIALS: Refer to Section 01 60 00 - PRODUCT REQUIREMENTS.

3. EXECUTION:

A. PERFORMANCE: Refer to Section 01 73 10 - EXECUTION REQUIREMENTS.

* * *

PROGRESS SCHEDULE Section 01 32 14

1. GENERAL:

A. DESCRIPTION: Within fifteen (15) days after award of the Contract, submit to the City estimated construction progress schedules for the Work, with sub-schedules of related activities essential to its progress.

B. RELATED REQUIREMENTS SPECIFIED ELSEWHERE: Refer to Section 01 31 00 - PROJECT MANAGEMENT AND COORDINATION for scheduling administrative procedures and project meeting requirements. Refer to General Provisions.

C. SUBMITTALS:
   1. General: Submit progress and submittal schedules in PDF form.
   2. Progress Schedule: Submit preliminary schedule for review; after review, resubmit required construction schedule with revised data within ten (10) days.
   3. Submittal Schedule: Refer to Section 01 33 10 - SUBMITTALS; paragraph 1.C.3 Submissions for submittal scheduling requirements.
   4. Revised Schedules:
      a. Progress Schedule: Submit with Application for Payment; refer to Section 01 29 00 - PAYMENT PROCEDURES.
      b. Submittal Schedules: Distribute five (5) days before initial Project Meeting; thereafter with agenda for subsequent biweekly project meetings.
   5. Distribution: Distribute copies of reviewed Schedules to project site, subcontractors, suppliers, and other concerned parties. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in Schedules.

D. CONTENT:
   1. Progress Schedule:
      a. General: Prepare network analysis system using the critical path method, as outlined in The Associated General Contractors of America (AGC) publication "The Use of CPM in Construction - A Manual for General Contractors".
      b. Content:
         1. Sequence of Listings: The chronological order of the start of each item of Work.
         2. Phases: Identify work of separate stages and other logically grouped activities. Provide sub-schedules for each stage of Work identified in Section 01 11 00 - SUMMARY OF WORK. Provide sub-schedules to define critical portions of the entire Schedule.
         3. Items of Work: Identify each item by specification section number.
         4. Percentage of Completion: Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
         5. Schedule of Values: Coordinate content with Schedule of Values specified in Section 01 29 00 - PAYMENT PROCEDURES.
   2. Submittals Schedule:
      a. General: Provide a complete list of specified Submittals by Section Number in PDF form. Maintain, update and distribute list, identifying dates of submittal receipt and return of reviewed submittals, for evaluation at scheduled biweekly project meetings.
      b. Specified Submittals: Identify required submittal dates for shop drawings, product data, and samples, etc.
      c. Reviewed Submittals: Date review of submittal will be required from City.
      d. Selection of Finishes: Indicate decision dates.

E. REVISIONS TO SCHEDULES:
   1. General: Indicate progress of each activity to date of submittal, and projected completion date of each activity.
   2. Revisions: Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
   3. Reports: Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.

2. PRODUCTS:

Not Used.

3. EXECUTION:

Not Used.

* * *

SUBMITTALS Section 01 33 10

1. GENERAL:

A. DESCRIPTION: Submit certifications, shop drawings, product data/material lists, manufacturer's instructions, and samples to the City for review as required.

B. RELATED REQUIREMENTS SPECIFIED ELSEWHERE:
   1. General: Specific submittal requirements are identified in the individual Sections of these specifications.
   2. Product Substitution Procedures: Section 01 25 00 - SUBSTITUTION PROCEDURES; products lists and substitution requests.
   3. Schedule of Values: Section 01 29 00 - PAYMENT PROCEDURES.
   4. Requests for Information (RFI): Section 01 26 31 - INFORMATION REQUEST PROCEDURE.
   5. Progress Schedule: Section 01 32 14 - PROGRESS SCHEDULE.
   6. Testing Laboratory Services: Section 01 45 23 - TESTING AND INSPECTION SERVICES; test reports.
   7. Closeout Procedures: Section 01 77 00 - CLOSEOUT PROCEDURES; operating and maintenance manuals, record drawings, and guarantees.

C. SUBMISSION PROCEDURES:
   1. General: Schedule submissions a minimum three (3) weeks before required for use.
   2. Submittal Requirements:
      a. General: Conform to specified procedures in submission of required submittals.
      b. Specified Products and Alternate Manufacturers: Products of specified manufacturers and named acceptable alternate manufacturers require submission of listed submittals.
      c. "Approved Equals" and Substitutions: See Section 01 25 00 - SUBSTITUTION PROCEDURES; requests for acceptance of products as "equal" or as substitution shall include listed submittals for subject products, requirements of the Substitution Request, and be submitted within the time frames specified in Section 01 25 00 - SUBSTITUTION PROCEDURES.
   3. Submissions:
      a. General: After issuance of Notice to Proceed make submissions no later than the following number of days, unless specified otherwise in individual specification Section.
      b. Early Start and/or Long Lead-Time Items: 30 calendar days.
      c. Color Selection Items: 30 calendar days.
      d. Electrical, Mechanical and Equipment Items: 60 calendar days.
      e. All Other Items: 90 calendar days.

D. SUBMISSION REQUIREMENTS:
   1. Cover Sheet:
      a. General: Provide a completed copy of the Submittal Cover Sheet included at the end of this Section with each submittal. Complete identified areas of the form as follows:
      b. Submittal Number: Identify first submittal as number one (1); number re-submittals, if required, with succeeding numbers.
      c. Specification Section: Identify submitted work with section number shown in the Project Manual. Provide separate submittals for each specification section, as required.
      d. Contractor: Provide company name and mailing address with signature of contact person responsible for work on this project, certifying to review of submittal, verification of field requirements and compliance with Contract Documents.
      e. Subcontractor: Provide company name, mailing address, telephone number and name of contact person responsible for work on this project.
      f. Submittal Description:
         1. General: Describe contents of submittal completely; identify if material is a resubmittal, and give previous submittal number.
         2. Submittal Index: List items included in submittal; properly cross reference to Contract Documents.
   2. Identification of Submittals:
      a. Date: Submission date and revision dates.
      b. Project: Project name and number; names of Architect, Contractor, and Subcontractor as shown on Submittal Cover Sheet.
      c. Product or Material: Name of manufacturer, product name or model number, and supplier.
      d. Contractor's Stamp: Initialed or signed, certifying to review of submittal, verification of field requirements and compliance with contract documents.

3. Number of Copies Required:
   a. Certifications, Shop Drawings, Product Data/Material Lists and Manufacturer's Instructions: One (1) electronic copy (PDF) of each submittal.
   b. Samples:
      1. General: As identified in individual specification section.
      2. Color/Pattern Selection: One set of manufacturer's complete range for initial selection; additional samples as requested of selected color/pattern for final color schedule.

E. SUBMITTALS:
1. Shop Drawings:
   a. General: Submit manufacture and installation details, including fastenings, for review. Make drawings legible and complete in every respect. Show relationship to adjacent structure or material; clearly identify all field dimensions.
   b. Variations: If shop drawings show variations from Contract requirements because of standard shop practice or other reason, specifically note such variations in letter of transmittal, as well as on drawings.
   c. Distribution: Reviewed shop drawings will be returned to Contractor for subsequent action, as required.
      1. No Resubmittal Required: Electronic copy (PDF) sent; Contractor may make copies for distribution.
      2. Resubmittal Required: Electronic copy (PDF) sent. Make corrections to original drawings and send new electronic copy (PDF) to City for review. Secure final review prior to commencing work.
2. Product Data/Material Lists:
   a. Manufacturer's Standard Schematic Drawings:
      1. General: Provide standard drawings; delete information not applicable to Project.
      2. Additional Information: Supplement standard information as required for Project.
   b. Product Data:
      1. General: Provide manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
      2. Identification: Clearly mark each copy; identify required materials, products or models.
      3. Required Information: Provide dimensions and clearances required; performance characteristics and capacities; and diagrams of equipment and controls.
   c. Distribution: Reviewed product data will be returned to Contractor for subsequent action, as required.
      1. No Resubmittal Required: Electronic copy (PDF) sent; Contractor may make copies for distribution.
      2. Resubmittal Required: Electronic copy (PDF) sent. Make corrections to original drawings and send new electronic copy (PDF) to City for review. Secure final review prior to commencing work.
3. Manufacturer's Instructions:
   a. General: Submit most recent applicable printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing of the subject material, as provided by the manufacturer for use under conditions similar to those of this Project.
   b. Distribution: Reviewed manufacturer's instructions will be returned to Contractor for subsequent action, as required.
      1. No Resubmittal Required: Electronic copy (PDF) sent; Contractor may make copies for distribution.
      2. Resubmittal Required: Electronic copy (PDF) sent. Make corrections to original drawings and send new electronic copy (PDF) to City for review. Secure final review prior to commencing work.
4. Samples:
   a. General: Submit samples to illustrate functional and aesthetic characteristics of product, with integral parts and attachment devices.
   b. Finishes: Submit manufacturer's full range of standard colors, patterns and textures.
   c. Office Samples: Provide in sufficient size and quantity to clearly illustrate product.
   d. Field Samples and Mock-Ups: Erect at Project site at location acceptable to City. Construct each sample or mockup complete, including work of trades required in finished work. After review, samples may be used in construction of project, as specified.

F. SUBMITTAL REVIEW:
1. General: Make submittals as required to cause no delay in the orderly progress of work, layout or fabrication under Contract, due allowance being made for checking by the City and for such corrections, resubmission and rechecking as may be necessary. Do not commence work requiring submittals until review by City has been completed.
2. Review: City's review will be for general conformance with the Contract Documents. Review

does not relieve Contractor from responsibility for coordinating work of various trades and compliance with requirements of Contract Documents for lengths, fit and other details, or from furnishing materials and work required by contract which may not be indicated on submittals when reviewed. Review does not authorize changes from Contract requirements. Efforts will be made by City to identify errors and omissions, but General Contractor is responsible for the accuracy and correctness of submittals.

3. Color Selections: City will make no color selections until all submittals related to color have been received and materials reviewed.

G. CERTIFICATIONS:
   1. General: Where specifically indicated by individual Sections, submit certification of recognized producer or association.
   2. Qualifications: Under various Sections of the technical specifications, under paragraph 1.D. QUALITY ASSURANCE of those Sections, certain experience requirements and other qualifications may be required. When such requirements are specified, submit written certification of such requirements to the City within thirty-five (35) days of date of Notice to Proceed.
   3. Products:
      a. Asbestos: Submit written certification that no materials containing asbestos have been included in the Work as required in Section 01 43 00 - QUALITY ASSURANCE.
      b. Volatile Organic Compounds (VOC): Provide written certification that materials used in construction operations and installed in the work comply with the requirements of the environmental protection agency having jurisdiction at the location of this Project.

2. PRODUCTS
Not Used

3. EXECUTION:
Not Used

* * *

SUBMITTAL COVER SHEET

PROJECT NAME Fire Station No. 5	JOB NO. 36907-D	SECTION NO.	SUBMITTAL NO.

SUBCONTRACTOR

NAME:

ADDRESS:

PHONE:

CONTACT:

CONTRACTOR CERTIFICATION

I hereby certify that I have reviewed the attached, and have verified field requirements and compliance with the Contract Documents.

CONTRACTOR:

ADDRESS:

SIGNED:_____ DATE: _____

SUBMITTAL DESCRIPTION

RESUBMITTAL? NO [ ] YES [ ] OF PREVIOUS SUBMITTAL NO. _____

SUBMITTAL HISTORY

DATE REC'D. FROM CONTR.

CONSULTANT REVIEW

[ ] Civil
[ ] Mechanical
[ ] Structural
[ ] Electrical
[ ] Landscape
[ ] Other

Date Sent: _____

Date Due: _____

Date Rec'd.: _____

DISTRIBUTION DATE _____

Copies to:

Contr. _____

Insp. _____

File _____

City _____

Other _____

REMARKS:

ROB WELLINGTON QUIGLEY, FAIA STAMP

Rob Wellington Quigley, FAIA
416 13th Street San Diego, CA 92101 Telephone: (619) 232-0888

SUSTAINABLE DESIGN REPORTING Section 01 33 29

1. GENERAL:

A. SUMMARY:
1. General: This Section includes general requirements and procedures for compliance with certain U.S. Green Building Council's (USGBC) LEED prerequisites and credits needed for the Project to obtain LEED Certified Silver certification.
2. Other LEED prerequisites and credits needed to obtain LEED certification are dependent on material selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests.
3. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification are dependent on the design and other aspects of the Project that are not part of the Work of the Contract.
4. Related Sections: Divisions 01 through 33 Sections for LEED requirements specific to the Work of each of those Sections. These requirements may or may not include reference to LEED.

B. DEFINITIONS:
1. Certificates of Chain-of-Custody: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria." Certificates shall include evidence that mill is certified for chain-of-custody by an FSC-accredited certification body.
2. LEED: Leadership in Energy & Environmental Design.
3. Rapidly Renewable Materials: Materials made from agricultural products that are typically harvested within a ten-year or shorter cycle. Rapidly renewable materials include products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.
4. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles from the Project location. Manufacturing refers to the final assembly of components into the building product that is installed at the Project site.
5. Regionally Extracted, Harvested, or Recovered Materials: Materials that are extracted, harvested, or recovered and manufactured within a radius of 500 miles from the Project site.
6. Recycled Content:
   a. General: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).
   b. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
   c. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

C. REFERENCES:
1. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): IAQ Guidelines for Occupied Buildings Under Construction.
2. U.S. Environmental Protection Agency (EPA):
   a. General: Guidelines for Energy Management.
   b. Indoor Air Quality (IAQ): Testing for Indoor Air Quality, Baseline IAQ, and Materials.
3. U.S. Green Building Council (USGBC):
   a. New Construction: LEED-BD+C Rating System.

D. SUBMITTALS:
1. General: LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.
2. Project Materials Cost Data: Provide statement indicating total cost for building materials used for Project. Include statement indicating total cost of mechanical and electrical components.
3. LEED Action Plans:
   a. General: Provide preliminary submittals within 30 days of date of Notice to Proceed indicating how the following requirements will be met.
   b. Credit MR 2.1 and 2.2: Waste management plan complying with Division 01 Section "Construction Waste Management."
   c. Credit MR 4.1 and 4.2:
      1. General: List of proposed materials with recycled content.
      2. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
   d. Credit MR 5.1 and 5.2:
      1. General: List of proposed regionally manufactured materials and regionally harvested or recovered materials.

2. Identify each regionally manufactured material, its source, and cost.
3. Identify each regionally harvested or recovered material, its source, and cost.

e. Credit MR 7.0:
1. General: List of proposed certified wood products.
2. Indicate each product containing certified wood, its source, and cost.
3. Include statement indicating total cost for wood-based materials used for Project, including non-rented temporary construction.

f. Credit EQ 3.1: Construction indoor air quality management plan.

4. LEED Progress Reports:
a. General: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
b. Credit MR 2.1 and 2.2: Waste reduction progress reports complying with Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
c. Credit MR 4.1 and 4.2: Recycled content.
d. Credit MR 5.1 and 5.2: Regionally manufactured materials and regionally harvested or recovered materials.

5. LEED Documentation Submittals:
a. General: In addition to the following, submit LEED Scorecard and other documentation required for LEED certification.
b. Credit SS 7.2: Product Data for roofing materials indicating Energy Star compliance.
c. Credit WE 3.1 and 3.2: Product Data for plumbing fixtures indicating water consumption.
d. Prerequisite EA 3.0: Product Data for new HVAC equipment indicating absence of CFC refrigerants.
e. Credit MR 2.1 and 2.2: Comply with Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
f. Credit MR 4.1 and 4.2: Product Data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
g. Credit MR 5.1 and 5.2:
1. General: Product Data indicating location of material manufacturer for regionally manufactured materials.
2. Include statement indicating cost and distance from manufacturer to Project for each regionally manufactured material.
3. Include statement indicating cost and distance from point of extraction, harvest, or recovery to Project for each raw material used in regionally manufactured materials.

h. Credit MR 7.0:
1. General: Product Data and certificates of chain-of-custody for products containing certified wood.
2. Include statement indicating costs for each product containing certified wood.
3. Include statement indicating total cost for wood-based materials used for Project, including non-rented temporary construction.

i. Credit EQ 1.0: Product Data and Shop Drawings for carbon dioxide monitoring system.
j. Credit EQ 3.1:
1. Construction indoor air quality management plan.
2. Product Data for temporary filtration media.
3. Product Data for filtration media used during occupancy.
4. Construction Documentation: Six photographs at three different occasions during construction along with a brief description of the SMACNA approach employed, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.

k. Credit EQ 3.2:
1. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
2. Product Data for filtration media used during flush-out and during occupancy.
3. Report from testing and inspecting agency indicating results of IAQ testing and documentation showing conformance with IAQ testing procedures and requirements.

l. Credit EQ 4.1: Product Data and material safety data sheets (MSDSs) for adhesives and sealants used on the interior of the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA method 24).
m. Credit EQ 4.2: Product Data and material safety data sheets (MSDSs) for paints and coatings used on the interior of the building indicating chemical composition and VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA method 24).
n. Credit EQ 4.3: Product Data for carpet products indicating VOC content of each product used.
o. Credit EQ 4.4: Product Data for composite wood and agrifiber products indicating that

products contain no urea-formaldehyde resin.
p. Include statement indicating adhesives and binders used for each product.
q. Credit EQ 6.2: Product Data and Shop Drawings for sensors and control system used to provide individual airflow and temperature controls for minimum 50 percent of non-perimeter, regularly occupied space.
r. Credit EQ 7: Product Data and Shop Drawings for sensors and control system used to monitor and control room temperature and humidity.

2. PRODUCTS:

A. SALVAGED AND REFURBISHED MATERIALS: Refer to Section 02 41 00 - DEMOLITION and 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
B. RECYCLED CONTENT OF MATERIALS:
1. Credits MR 4.1 and MR 4.2: Provide building materials with recycled content such that post-consumer recycled content constitutes a minimum of 10 percent of the cost of materials used for the Project or such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 20 percent of the cost of materials used for the Project.
2. The cost of post-consumer recycled content of an item shall be determined by dividing the weight of post-consumer recycled content in the item by the total weight of the item and multiplying by the cost of the item.
3. The cost of post consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing the weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by the total weight of the item and multiplying by the cost of the item.
a. Do not include mechanical and electrical components in the calculation.
b. Recycled content of materials shall be defined according to the Federal Trade Commission's "Guide for the Use of Environmental Marketing Claims," 16 CFR 260.7 (e).
C. REGIONAL MATERIALS:
1. Credit MR 5.0: Provide 10 percent minimum (20 percent goal) of building materials (by cost) that are regionally manufactured materials. Of the regionally manufactured materials required, provide at least 20 percent (by cost) that are regionally extracted, harvested, or recovered materials.
D. CERTIFIED WOOD:
1. Credit MR 7.0:
a. General: Provide a minimum of 50 percent (by cost) of wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."
b. Wood-based materials include but are not limited to the following materials when made from made wood, engineered wood products, or wood-based panel products:
c. Rough carpentry.
d. Miscellaneous carpentry.
e. Heavy timber construction.
f. Wood decking.
g. Metal-plate-connected wood trusses.
h. Structural glued-laminated timber.
i. Finish carpentry.
j. Architectural woodwork.
k. Wood paneling.
l. Wood veneer wall covering.
m. Wood flooring.
n. Wood lockers.
o. Wood cabinets.
p. Non-rented temporary construction, including bracing, concrete formwork, pedestrian barriers, and temporary protection.
E. LOW-EMITTING MATERIALS:
1. Credit EQ 4.1:
a. General: For interior applications use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24):
b. Wood Glues: 30 g/L.
c. Metal to Metal Adhesives: 30 g/L.
d. Adhesives for Porous Materials (Except Wood): 50 g/L.
e. Subfloor Adhesives: 50 g/L.
f. Plastic Foam Adhesives: 50 g/L.
g. Carpet Adhesives: 50 g/L.
h. Carpet Pad Adhesives: 50 g/L.
i. VCT and Asphalt Tile Adhesives: 50 g/L.

j. Cove Base Adhesives: 50 g/L.
k. Gypsum Board and Panel Adhesives: 50 g/L.
l. Rubber Floor Adhesives: 60 g/L.
m. Ceramic Tile Adhesives: 65 g/L.
n. Multipurpose Construction Adhesives: 70 g/L.
o. Fiberglass Adhesives: 80 g/L.
p. Structural Glazing Adhesives: 100 g/L.
q. Wood Flooring Adhesive: 100 g/L.
r. Contact Adhesive: 250 g/L.
s. Plastic Cement Welding Compounds: 350 g/L.
t. ABS Welding Compounds: 400 g/L.
u. CPVC Welding Compounds: 490 g/L.
v. PVC Welding Compounds: 510 g/L.
w. Adhesive Primer for Plastic: 650 g/L.
x. Sealants: 250 g/L.
y. Sealant Primers for Nonporous Substrates: 250 g/L.
z. Sealant Primers for Porous Substrates: 775 g/L.

2. Credit EQ 4.2:
   a. General: For interior applications use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the following chemical restrictions:
   b. Flat Paints and Coatings: VOC not more than 50 g/L.
   c. Non-Flat Paints and Coatings: VOC not more than 150 g/L.
   d. Anti-Corrosive Coatings: VOC not more than 250 g/L.
   e. Varnishes and Sanding Sealers: VOC not more than 350 g/L.
   f. Stains: VOC not more than 250 g/L.
   g. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   h. Restricted Components:
      1. General: Paints and coatings shall not contain any of the following:
      2. Acrolein.
      3. Acrylonitrile.
      4. Antimony.
      5. Benzene.
      6. Butyl benzyl phthalate.
      7. Cadmium.
      8. Di (2-ethylhexyl) phthalate.
      9. Di-n-butyl phthalate.
      10. Di-n-octyl phthalate.
      11. 1,2-dichlorobenzene.
      12. Diethyl phthalate.
      13. Dimethyl phthalate.
      14. Ethylbenzene.
      15. Formaldehyde.
      16. Hexavalent chromium.
      17. Isophorone.
      18. Lead.
      19. Mercury.
      20. Methyl ethyl ketone.
      21. Methyl isobutyl ketone.
      22. Methylene chloride.
      23. Naphthalene.
      24. Toluene (methylbenzene).
      25. 1,1,1-trichloroethane.
      26. Vinyl chloride.
3. Credit EQ 4.4: Do not use composite wood and agrifiber products that contain urea-formaldehyde resin.

3. EXECUTION:

A. CONSTRUCTION WASTE MANAGEMENT:
   1. Credit MR 2.1 and 2.2: Refer to Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
B. CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT:
   1. Credit EQ 3.1: Comply with SMACNA IAQ Guideline for Occupied Buildings under Construction.

2. Credit EQ 3.2:
   a. General: Conduct a two-week building air flush-out after construction ends with new filtration media and 100 percent outside air. Replace filtration media after building air flush-out.
   b. Air Flush-Out: Refer to Section 230980 - MECHANICAL COMMISSIONING.
   c. City will conduct a baseline indoor air quality testing program according to EPA Protocol for Environmental Requirements, Baseline IAQ and Materials. Payment for these services will be made by City.

* * *

Project Name: Fire Station No. 5

Date: ____________________

PROCUREMENT TRACKING
PROJECT MATERIALS INFORMATION

CSI '14 Section Number	Product Description	Quantity	Cost	Percent Recycled Content	Manufacturer Information	Documentation

Project Name: Fire Station No. 5
Date: _____

PROCUREMENT TRACKING
MATERIALS RECYCLED CONTENT

CSI '14 Section Number	Product	Company	Cost	% Post-Consumer Recycled Content	% Pre-Consumer Value ($)	% Pre-Consumer Recycled Content	% Post-Consumer Value ($)	Recycled Content Information Source

Subtotals	
Total Construction Material Value	
Less MR 3.1 Value	
Net Construction Material Value	
Division 12 Material Value	
Less MR 3.2 Value	
Net Project Material Value	
% Post-Consumer + ½ Pre-Consumer	

Project Name: Fire Station No. 5
Date: _____

PROCUREMENT TRACKING REGIONAL MATERIALS

CSI '14 Section Number	Product Name	Manufacturer	Distance Between Project Site & Manufacturer (Miles)	Product Cost ($)	Distance Between Project & Extraction Site (Miles)	Product Cost ($)	Regional Content Information Source

Component Totals
Total Construction Material Value
Division 12 Material Value
Total Project Material Value
% Manufactured Regionally
% Both Manufactured Regionally & Extracted Regionally

Project Name: Fire Station No. 5

Date: ____________________

PROCUREMENT TRACKING
LOW VOC MATERIALS

Product Name	Manufacturer	Where Installed	Chemical Contaminants	Product Information (Cut Sheet or MSDS)

ELECTRONIC MEDIA TRANSFER AGREEMENT Section 01 33 90

1. GENERAL:

A. DESCRIPTION: This section provides procedures for the Contractor's use of the computer aided design (CAD) files for preparation of submittals.

B. SUBMISSION PROCEDURES:

1. General: Submit request for electronic data transfer by signing the Agreement included at the end of this Section and sending hard copy with an appropriate explanatory transmittal to the City.
2. Time: Submit request a minimum of seven (7) days prior to the date that files are needed.

C. CITY'S RESPONSE: Files will be emailed or provided on electronic media, as requested in the transmittal. Files will be in the program used for creation of the files; any necessary translations will be the responsibility of the Contractor. City is not responsible for any problems encountered as a result of electronic transmission or translation.

D. DISTRIBUTION: Submit PDF of original, signed copy of the Agreement. Co-signed copy will be returned to the Contractor.

2. PRODUCTS:

Not Used

3. EXECUTION:

Not Used

* * *

ELECTRONIC MEDIA TRANSFER AGREEMENT

PROJECT NAME:	Fire Station No. 5 San Diego, California
ARCHITECT'S PROJECT NO.:	Job No. 36907-D
ARCHITECT:	Rob Wellington Quigley, FAIA 416 13th Street San Diego, CA 92101
CONTRACTOR:	Firm Name: Address: City, State, Zip:

Electronic media will remain the property of the Architect and its consultants and will be subject to their copyright. The Architect and its consultants will provide the Contractor only a working copy of the electronic media. Said working copy will have indices of the Architect's and consultants' ownership, professional name, and/or involvement in the project removed from the electronic display.

This computer aided design (CAD) working copy is provided for the convenience of the recipient only. The working copy represents data prepared as the Architect's and its consultants' internal set of working documents. As such it may be incomplete, contain deliberate or unintentional inaccuracies or be in part obsolete. In addition, intentional or unintentional changes to the working copy may occur during its use, storage, or translation by parties other than the Architect and its consultants, and the Architect and its consultants have no control over such changes that may occur. Therefore, the Architect and its consultants make no representation as to the completeness, currency or accuracy of the working copy. The Contractor is further warned that, while digital CAD data appears to be extremely accurate, this apparent accuracy is an artifact of the techniques used to generate it and is in no way intended to imply actual accuracy. The Contractor takes full responsibility for the accuracy and correctness of measurements, areas, inventories, etc. extracted from this data either manually or with the use of a computer, and for conclusions drawn from this data.

The Contractor is advised that translation of CAD data from one computer system or environment to another can and often does result in the loss of data. This loss can include but may not be limited to: portions of text and dimensions - the existence, location or scale of symbols or other elements of graphics - the internal structure of the data including layers and data attributes - the style or weight of lines. The Architect and its consultants make no representation as to the usability of this CAD data on any system.

The Contractor is advised to review all current and subsequent project documentation issued for inconsistencies and revisions. It is the responsibility of the Contractor to identify and make required revisions and corrections to the data on the working copy.

The Contractor acknowledges that the Architect and its consultants provide the working copy for information only and they do not represent that the electronic media will exactly correspond to the Contract Documents. A statement will be electronically placed on each working copy drawing sheet as follows: "Not for construction purposes. The Contract Documents as bid may contain additions, modifications, or deletions not shown on this working copy." Based in part, but not limited to, the foregoing discussion of the limitations and character of the working copy to be provided under this agreement, the Contractor specifically acknowledges that the working copy may be unreliable and/or inaccurate and/or incomplete. Contractor further acknowledges that it has and shall continue to have the sole responsibility for the accurate, complete, and timely production, completion, and submission of shop drawings and other documents prepared with the assistance of the working copy, and that the receipt of the working copy does not diminish or affect Contractor's duty with regard to said production, completion, or submission. As such, Contractor agrees that use of the working copy shall be undertaken solely at its own risk, and that the Architect and its consultants shall assume no liability whatsoever that may arise out of such use by the Contractor or any other party.

In furtherance of the above, and in consideration of the use of the working copy, Contractor agrees to release and, to the fullest extent permitted by law, defend, indemnify, and hold harmless the City, Architect and its partners, consultants, agent and employees from and against any and all claims, suits, actions, demands, losses, expenses, damages, penalties, and liabilities of any kind, including without limitation, attorney fees, arising out of or relating to such other use or changes to such working copy.

In addition, Contractor and Architect agree that this agreement is not a construction contract within the scope of California Civil Code section 2782.

Contractor shall ensure that any subcontractor to whom he permits access to the working copy shall be bound in writing to all the terms of this agreement.

Contractor and Architect agree that this agreement represents the total agreement between them, and incorporates all prior written and oral understandings. Contractor and Architect further agree that clauses and provisions of this contract are to be severable from one another, and in the event that one or more clauses or provisions of this contract are declared illegal or otherwise invalid by a court of competent jurisdiction, that all other clauses and provisions of the contract that remain shall be of full force and effect.

Accepted by:	Accepted by:
_____	_____
Contractor's Representative	Architect's Representative
Date: _____	Date: _____

* * *

REFERENCES Section 01 42 00

1. GENERAL:

A. SUMMARY
1. Description:
   a. General: Standards, codes, definition of words and terms, are identified in this Section.
   b. Additional Instructions: Refer to 00 01 08 - USER GUIDE FOR THE PROJECT MANUAL.
2. Related Work:
   a. General: The following items of Work are related to the Work of this Section but specified elsewhere in this Project Manual.
   b. Quality Standards: Refer to Section 01 43 00 - QUALITY ASSURANCE.

B. REFERENCES:
1. General: References are made throughout the technical specifications to various standard specifications, codes, practices, and requirements for materials, work quality, installation, inspections and tests, which are published and issued by the organizations, societies and associations listed below by abbreviation and name.
2. Referenced Standards: Obtain copies direct from publication sources as needed for proper performance and completion of the Work. Addresses for these organizations are available from the City.

C. STANDARDS: All references to established Standards mean and include the latest edition of such Standards, as of the date of issue of this Project Manual.

D. CODES:
1. General: Work of this project shall conform to applicable codes, current editions with applicable amendments, as adopted by enforcing agencies.
2. Applicable Codes:
   a. California Building Code (CBC):
      1. General: California Building Standards Commission.
      2. Building Standards Administrative Code: Title 24, Part 1.
      3. Building Code: Volume 1 and 2; Title 24, Part 2, Volume 1 and 2.
      4. Electrical Code: Title 24, Part 3.
      5. Mechanical Code: Title 24, Part 4.
      6. Plumbing Code: Title 24, Part 5.
      7. Energy Code: Title 24, Part 6.
      8. Elevator Construction Safety Code: Title 24, Part 7.
      9. Fire Code: Title 24, Part 9.
      10. Green Building Standards Code: Title 24, Part 11.
      11. Referenced Standards Code: Title 24, Part 12.
   3. Americans with Disabilities Act (ADA): Latest edition; Civil Rights Division, Office on the Americans with Disabilities Act, U.S. Department of Justice
   4. National Fire Protection Association (NFPA): Life Safety Code - NFPA 101.
   a. U. S. Environmental Protection Agency (EPA): Laws and regulations.
   b. California Environmental Protection Agency (CalEPA): State regulations and standards.
   c. California Integrated Waste Management Board:
      1. General: Sustainable Building Guidelines.
      2. Construction Waste Management: Construction and Demolition Debris Recycling.
   d. California State Water Resources Control Board (SWRCB): SWPPP Standards.
   e. Public Utilities: Rules, regulations and standards of jurisdictional agencies.

E. DEFINITIONS:
1. Words and Terms:
   a. General: The following are used in addition to those defined in the General Conditions, and are defined as follows:
   b. Approved Equal: Reviewed and accepted by the City as being equal in quality, utility and appearance.
   c. Approved: As accepted by the City.
   d. As Required: As required by regulatory requirements, referenced standards, existing conditions, or by the Contract Documents.
   e. Directed: As instructed by the City in writing.
   f. Furnish: Supply and deliver to the site.
   g. Indicated: As shown, noted, or scheduled on the Drawings.
   h. Install: Anchor, fasten, or connect in place and adjust for use; place or apply in proper position and location; establish in place for use or service.
   i. Provide: Furnish and install.
   j. Site: Area to be occupied by the Project. Use of the word "jobsite" or "site" shall be

interpreted to be synonymous with "site of the Work" or "Work Site".

2. Abbreviations:
   a. General: Definition of abbreviations and symbols used on the Drawings are identified on the Drawings.
   b. Governing Dictionary: The definitions of words and abbreviations used in these Specifications are given in "The American Heritage Dictionary of the English Language".

2. PRODUCTS:

A. GENERAL: The reference standards applicable to this Project are specifically identified in the technical specification Sections listed in the Table of Contents - Divisions 02 through 33.

B. ASSOCIATION AND AGENCY NAMES: The following abbreviation or acronym shall be understood to mean the full name of the respective organization or document, as follows:

A

American Association of Automatic Door Manufacturers (AAADM)
Aluminum Association (AA)
Associated Air Balance Council (AABC)
Aluminum Anodizers Council (AAC)
American Architectural Manufacturers Association (AAMA)
Association of Asphalt Paving Technologists (AAPT)
American Association of Radon Scientists and Technologists (AARST)
American Association of State Highway and Transportation Officials (AASHTO)
American Association of Textile Chemists and Colorists (AATCC)
Amateur Athletic Union (AAU)
American Association of Wood Turners (AAW)
American Boiler Manufacturers Association (ABMA)
American Coal Ash Association (ACAA)American Copper Council (ACC)
Air Conditioning Contractors Association (ACCA)
American Consulting Engineers Council (ACEC)
American Concrete Institute (ACI)
American Construction Inspectors Association (ACIA)
American Council of Independent Laboratories (ACIA)
American Concrete Pavement Association (ACPA)
American Concrete Pumping Association (ACPA)
American Concrete Pipe Association (ACPA)
American Concrete Pressure Pipe Association (ACPPA)
Americans with Disabilities Act (ADA)
Art Dealers Association of America (ADAA)
Air Diffusion Council (ADC)
Air Distribution Institute (ADI)
American Extruders Council (AEC)
Audio Engineering Society (AES)
Automatic Fire Alarm Association (AFAA)
American Fence Association (AFA)
American Fiberboard Association (AFA)
American Floorcovering Alliance (AFA)
Anti-Friction Bearing Manufacturers Association (AFBMA)
Association for Facilities Engineering (AFE)
American Furniture Manufacturers Association (AFMA)
American Forest and Paper Association (AFPA)
American Fire Sprinkler Association (AFSA)
American Galvanizers Association (AGA)
American Gas Association (AGA)
Art Glass Association (AGA)
Associated General Contractors of America (AGC)
Automated Guided Vehicle Systems Section of the Material Handling Institute (AGVS)
Association of Home Appliance Manufacturers (AHAM)
American Hardwood Export Council (AHEC)
American Hardware Manufacturers Association (AHMA)
Appalachian Hardwood Manufacturers Association (AHMA)
Asphalt Institute (AI)
American Institute of Architects (AIA)
American Insurance Association (AIA)
American Industrial Hygiene Association (AIHA)
American Institute of Steel Construction (AISC)
American Iron and Steel Institute (AISI)

American Institute of Timber Construction (AITC)
American Lighting Association (ALA)
Associated Landscape Contractors of America (ALCA)
American Ladder Institute (ALI)
Associated Locksmiths of America (ALOA)
American Lumber Standards Committee, Inc. (ALSC)
Air Movement and Control Association International, Inc. (AMCA)
Architectural Metal Products Division of NAAMM (AMP)
American Nursery and Landscape Association (ANLA)
American National Standards Institute (ANSI)
American Planning Association (APA)
The Engineered Wood Association (APA)
American Portland Cement Alliance (APCA)
American Pipe Fitters Association (APFA)
American Petroleum Institute (API)
American Park and Recreation Society (APRS)
American Public Works Association (APWA)
American Rolling Door Association (ARDA)
Association of Refrigerant and Desuperheating Manufacturers (ARDM)
Air-Conditioning and Refrigeration Institute (ARI)
Asphalt Roofing Manufacturers Association (ARMA)
Asphalt Recycling and Reclaiming Association (ARRA)
American Road and Transportation Builders Association (ARTBA)
Air-conditioning and Refrigeration Wholesalers International (ARWI)
Acoustical Society of America (ASA)
Adhesive and Sealant Council (ASC)
Alliance to Save Energy (ASE)
American Society of Consulting Arborists(ASCA)
American Society of Concrete Contractors (ASCC)
American Society of Civil Engineers (ASCE)
American Society of Furniture Designers (ASFD)
American Society of Golf Course Architects (ASGCA)
American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
American Society of Interior Designers (ASID)
American Society of Landscape Architects (ASLA)
American Society of Mechanical Engineers (ASME)
American Society of Plumbing Engineers (ASPE)
American Society of Interior Designers (ASID)
Automated Storage/Retrieval Systems (AS/RS)
American Society of Sanitary Engineering (ASSE)
American Society for Testing and Materials (ASTM)
Alliance for Telecommunications Industry Solutions (ATIS)
American Textile Manufacturers Institute (ATMI)
Association of Vacuum Equipment Manufacturers (AVEM)
Association of Wall and Ceiling Industries-International (AWCII)
Association of Woodworking and Furnishings Suppliers (AWFS)
Architectural Woodwork Institute (AWI)
American Wood Preservers Association (AWPA)
American Wood Preservers Institute (AWPI)
American Welding Society (AWS)
American Water Works Association (AWWA)
American Zinc Association (AZA)

B

Bath Enclosure Manufacturers Association (BEMA)
Bare Granite Association (BGA)
Bureau of Home Furnishings and Thermal Insulation, State of California, Dept. of Consumer Affairs (BHFTI)
Builders Hardware Manufacturers Association (BHMA)
Brick Industry Association (BIA)
Business and Institutional Furniture Manufacturer's Association (BIFMA)
Building Owners and Managers Association International (BOMA)
Building Stone Institute (BSI)

C

Compressed Air and Gas Institute (CAGI)
California Occupational Safety and Health Administration (CalOSHA)

State of California, Department of Transportation (CalTrans)
California Stormwater Quality Association (CASQA)
Color Association of the United States (CAUS)
Copper and Brass Fabricators Council (CBFC)
Copper and Brass Servicecenter Association (CBSA)
Certified Ballast Manufacturers (CBM)
Carpet Cushion Council (CCC)
Copper Development Association (CDA)
Conveyor Equipment Manufacturers Association (CEMA)
California Forestry Association (CFA)
Chemical Fabrics and Film Association, Inc. (CFFA)
Compressed Gas Association (CGA)
Ceiling and Interior Systems Construction Association (CISCA)
Cast Iron Soil Pipe Institute (CISPI)
Chain Link Fence Manufacturing Institute (CLFMI)
Construction Management Association of America (CMAA)
Composite Panel Association (CPA)
Concrete Pipe Association (CPA)
Ceramic Manufacturers Association (CMA)
Crane Manufacturers Association (CRA)
California Redwood Association (CRA)
Conference of Radiation Control Program Directors (CRPD)
Carpet and Rug Institute (CRI)
Custom Roll Forming Institute (CRFI)
Concrete Reinforcing Steel Institute (CRSI)
Concrete Foundations Institute (CFI)
Conference for Responsible Waste Incineration (CRWI)
Concrete Sawing and Drilling Association (CSDA)
Commercial Standard (CS), U.S. Department of Commerce
Conveyor Section of the Materials Handling Institute (CS)
Canadian Standards Association (CSA)
Central Station Alarm Association (CSAA)
Cast Stone Institute (CSI)
Construction Specifications Institute (CSI)
Chimney Safety Institute of America (CSIA)
California State Industrial Accident Commission (CSIAC)
U.S. Consumer Product Safety Commission (CPSC)
Cedar Shingle and Shake Bureau (CSCB)
Ceramic Tile Institute of America (CTI)
Composite Wood Council (CWC)

D

Door Access Systems Manufacturers Association International (DASMA)
Diesel Engine Manufacturers Association (DEMA)
Design Build Institute of America (DBIA)
Door Hardware Institute (DHI)
Ductile Iron Pipe Research Association (DIPRA)
Ductile Iron Society (DIS)
State of California, Division of the State Architect, Office of Regulation Services (DSA)

E

Expanded Clay Shale and Slate Institute (ECSSI)
Energy Communication and Electrical Association (ECEA)
Energy Efficient Lighting Association (EELA)
Institute of Electrical and Electronics Engineers (IEEE)
Electronic Industries Association (EIA)
Environmental Information Association (EIA)
EIFS Industry Manufacturers Association (EIMA)
Electrical Generating Systems Association (EGSA)
European Committee for Standardization (CEN)
Expansion Joint Manufacturers Association (EJMA)
Expanded Metal Manufacturers Association Division of NAAMM (EMMA)
Electric Power Supply Association (EPSA)
ETL Testing Laboratories (ETL)

F

Federal Communications Commission (FCC)
Fluid Controls Institute (FCI)
Floor Covering Installation Contractors Association (FCICA)
Forrest Certification Resource Center (FCRC)
Fire Equipment Manufacturers Association (FEMA)
Food Equipment Manufacturers Association (FEMA)
Flat Glass Marketing Association (FGMA) is now part of Glass Association of North America (GANA)
Forging Industry Association (FIA)
Factory Mutual Research and Engineering Corporation (FM) is now part of Intertec Testing Services (ITS)
Forrest Products Society (FPS)
Food Processing Machinery and Supplies Association (FPMSA)
Fabricators and Manufacturers Association International (FMA)
Forrest Resources Association (FRA)
Federal Specification - Generals Services Administration (FS)
Fire Suppression Systems Association (FSSA)

G

Gypsum Association (GA)
Gas Appliance Manufacturers Association (GAMA)
Golf Course Builders Association of America (GCBA)
Glass Association of North America (GANA)
Germany Institute for Standardization (GIS) - Deutches Institut fur Normung (DIS)

H

Hardwood Council (HC)
Heat Exchange Institute (HEI)
Home Furnishings Association International Association (HFIA)
Hydraulic Institute (HI)
Hollow Metal Manufacturers Association Division of NAAMM (HMMA)
Hardwood Manufacturers Association (HMA)
Hardwood Plywood and Veneer Association (HPVA)
U.S. Department of Housing and Urban Development (HUD)

I

International Association of Electrical Inspectors (IAEI)
International Association of Plumbing and Mechanical Officials (IAPMO)
International Association of Lighting Designers (IALD)
International Copper Association (ICA)
Insulation Contractors of America (ICAA)
Insulated Cable Engineers Association (ICEA)
International Concrete Repair Institute (ICRI)
International Cast Polymer Association (ICPA)
Interlocking Concrete Pavement Institute (ICPI)
International Compressor Remanufacturers Association (ICRA)
Independent Electrical Contractors (IEC)
International Erosion Control Association (IECA)
Institute of Electrical and Electronics Engineers (IEEE)
Illuminating Engineering Society of North America (IES)
International Electrical Testing Association (IETA)
Industrial Fasteners Institute (IFA)
Industrial Fabrics Association International (IFAI)
International Firestop Council (IFC)
Independent Forest Products Association (IFPA)
International Furnishings and Design Association (IFDA)
Independent Glass Association (IGA)
Insulating Glass Certification Council (IGCC)
Insulating Glass Manufacturers Alliance (IGMA)
International Ground Source Heat Pump Association (IGSHPA)
Industrial Heating Equipment Association (IHEA)
International Interior Design Association (IIDA)
Institute of Noise Control Engineering (INCE)
Indiana Limestone Institute of America (ILIA)
International Masonry Institute (IMI)
International Municipal Signal Association (IMSA)
Association of the Nonwoven Fabrics Industry (INDA)

International Titanium Association (ITA)
Intertek Testing Services (ITS)
International Sign Association (ISA)
Instrument Society for Measurement and Control (ISA)
International Sanitary Supply (ISSA)
Insulated Steel Door Institute (ISDI)
International Standards Organization (ISO)
Iron and Steel Society (ISS)
International Slurry Surfacing Association (ISSA)
International Window Cleaning Association (IWCA)
International Window Film Association (IWFA)
International Wood Products Association (IWPA)

J

Joint Industry Board of the Electrical Industry (JIBEI)

K

Kitchen Cabinet Manufacturers Association (KCMA)

L

Lead Industries Association, Inc. (LIA)
Light Gage Steel Engineers Association (LGSEA)
Laminating Materials Association (LMA)
Loading Dock Equipment Manufacturers Association (LDEMA)
Lift Manufacturers Product Section of the Materials Handling Institute (LMP)
Lightning Protection Institute (LPI)
Lighting Research Center (LRC)
Laminators Safety Glass Association (LSGA) is part of Glass Association of North America (GANA)

M

Modular Building Institute (MBI)
Metal Building Manufacturers Association (MBMA)
Modular Building Systems Council (MBSC)
Metal Construction Association (MCA)
Masonry Contractors of America (MCAA)
Mechanical Contractors Association of America (MCAA)
Maple Flooring Manufacturers Association (MFMA)
Metal Framing Manufacturers Association (MFMA)
Material Handling and Management Society (MHMS)
Marble Institute of America (MIA)
Masonry Institute of America (MIA)
Metal Bar and Grating Division of NAAMM (MBG)
Masonry Society (MS)
Manufacturers Standardization Society of the Valve and Fittings Industry (MSSVFI)
Metal Treating Institute (MTI)

N

National Aggregate Association NAA)
National Arborist Association (NAA)
National Alarm Association of America (NAAA)
National Association of Architectural Metal Manufacturers (NAAMM)
National Antique and Art Dealers Association (NAADA)
North American Electric Reliability Council (NAERC)
North American Association of Food Equipment Manufacturers (NAAFEM)
North American Insulation Manufacturers Association (NAIMA)
North American Laminate Floor Association (NALFA)
National Association of Metal Finishers (NAMF)
National Association of Noise Control Officials (NANCO)
National Asphalt Pavement Association (NAPA)
National Association of Reinforcing Steel Contractors (NARSC)
National Association of Relay Manufacturers (NARM)
North American Steel Framing Alliance (NASFA)
National Association of Store Fixture Manufacturers (NASFM)
National Association of Vertical Transportation Professionals (NAVTP)
National Association of Women in Construction (NAWIC)
North American Wholesale Lumber Association (NAWLA)
National Board of Boiler and Pressure Vessel Inspectors (NBBPVI)
National Burglar and Fire Alarm Association (NBFAA)

National Board of Fire Underwriters (NBFU) - See American Insurance Association (AIA)
National Blacksmith and Welders Association (NBWA)
National Collegiate Athletic Association (NCAA)
National Council of Acoustical Consultants (NCAC)
National Concrete Masonry Association (NCMA)
National Certified Pipe Welding Bureau (NCPWB)
National Clay Pipe Institute (NCPI)
National Councill of Qualification for Lighting Professions (NCQLP)
National Council on Radiation Protection and Measurements (NCRPM)
National Corrugated Steel Pipe Association (NCSPA)
National Elevator Contractors Association (NECA)
National Elevator Industry, Inc. (NEII)
National Electrical Manufacturers Association (NEMA)
International Electrical Testing Association (NETA)
National Forestry Association (NFA)
Northwest Forestry Association (NFA)
National Frame Builders Association (NFBA)
National Fire Protection Association (NFPA)
National Fenestration Rating Association (NFRA)
National Fire Sprinkler Association (NFSA)
National Glass Association (NGA)
National Home Furnishings Association (NHFA)
National Hardwood Lumber Association (NHLA)
National Insulation Association (NIA)
National Institute of Steel Detailing (NISD)
National Institute of Standards and Technology (NIST)
National Kitchen & Bath Association (NKBA)
National Landscape Association (NLA)
National Lime Association (NLA)
Northwestern Lumber Association (NLA)
National Lighting Bureau (NLB)
National Lumber Grades Authority (NLGA)
Northeastern Lumber Manufacturers Association (NLMA)
National Metal Decorators Association (NMDA)
National Metal Spinners Association (NMSA)
National Oak Flooring Manufacturers Association (NOFMA)
National Ornamentation and Miscellaneous Metals Association (NOMMA)
National Particleboard Association (NPA) Division of the Composite Panel Association (CPA)
National Paint and Coatings Association (NPCA)
National Precast Concrete Association (NPCA)
National Refrigeration Contractors Association (NRCA)
National Roofing Contractors Association (NRCA)
National Roof and Deck Contractors Association (NRDA)
National Roofing Foundation (NRF)
National Ready-Mix Concrete Association (NRMCA)
National Stone Association (NSA)
National Sunroom Association (NSA)
National Sash and Door Jobbers Association (NSDJA)
National Sanitation Foundation International (NSF)
National Standard Plumbing Code Committee (NSPCC)
National Swimming Pool Foundation (NSPF)
National Stone, Sand and Gravel Association (NSSGA)
National Spa and Pool Institute (NSPA)
National Society of Professional Engineers (NSPE)
National School Supply and Equipment Association (NSSEA)
National Tile Contractors Association (NTCA)
National Terrazzo and Mosaic Association (NTMA)
National Wood Flooring Association (NWFA)

O

Occupational Safety and Health Administration (OSHA)
State of California, Office of Public School Construction (OPSC)
State of California, Office of Statewide Health Planning and Development (OSHPD)

P

Power Actuated Tool Manufacturers' Institute, Inc. (PATMI)

Portland Cement Association (PCA)
Power and Communication Contractors Association (PCCA)
Precast/Prestressed Concrete Institute (PCI)
Painting and Decorating Contractors of America (PDCA)
Plumbing and Drainage Institute (PDI)
Primary Glass Manufacturers Council (PGMC)
Plumbing-Heating-Cooling Contractors Association (PHCCA)
Polyisocyanurate Manufacturers Association (PIMA)
Precision Metalforming Association (PMA)
Project Management Institute (PMI)
Plumbing Manufacturers Institute (PMI)
Plastics and Metal Products Manufacturers Association (PMPMA)
Porcelain Enamel Institute (PEI)
Plastics Institute of America (PIA)
Plastic Pipe Institute (PPI)
Polyurethane Manufacturers Association (PMA)
Product Standard (PS), National Bureau of Standards
Portable Sanitation Association International (PSA)
Plastic Soft Materials Manufacturers Association (PSMMA)

Q

None

R

Rainforest Alliance (RA)
Roof Consultants Institute (RCI)
Roof Coating Manufacturers Association (RCMA)
Refrigeration Engineers and Technicians Association (RETA)
Resilient Floor Covering Institute (RFCI)
Reflective Insulation Manufacturers Association (RIMA)
Redwood Inspection Service (RIS) Division of the California Redwood Association (CRA)
Rubber Manufacturers Association (RMA)
Refactory Metals Association (RMA)
Rack Manufacturers Institute (RMI)
Roof Tile Institute (RTI)

S

Scientific Apparatus Makers Association (SAMA)
Society of American Registered Architects (SARA)
Specifications Consultants in Independent Practice (SCIP)
Southern Cypress Manufacturers Association (SCMA)
Scientific Certification Systems (SCS)
Steel Deck Institute (SDI)
Steel Door Institute (SDI)
Steel Erectors Association of America (SEAA)
Structural Engineering Institute (SEI)
State of California, State Fire Marshal (SFM)
Society of Fire Protection Engineers (SFPE)
Stained Glass Association of America (SGAA)
Safety Glazing Certification Council (SGCC)
Society of Glass and Ceramic Decorators (SGCD)
Structural Insulated Panel Association (SIPA)
Security Industry Association (SIA)
Scaffolding Industry Association (SIA)
Society for Information Display (SID)
Sealed Insulating Glass Manufacturers Association (SIGMA)
Steel Joist Institute (SJI)
Southeastern Lumber Manufacturers Association (SLMA)
Screen Manufacturers Association (SMA)
Stucco Manufacturers Association (SMA)
Steel Manufacturers Association (SMA)
Storage Equipment Manufacturers Association (SMA)
Shelving Manufacturers Association (SMA)
Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
Southern Pine Council (SPC)
Society of Plastics Engineers (SPE)

Steel Plate Fabricators Association (SPFA)
Southern Pine Inspection Bureau (SPIB)
Single-Ply Roofing Institute (SPRI)
Steel Recycling Institute (SRI)
Scaffolding, Shoring and Forming Institute (SSFI)
Specialty Steel Industry of North America (SSINA)
Steel Stud Manufacturers Association (SSMA)
Steel Structures Painting Council (SSPC)
Sump and Sewage Pump Manufacturers Association (SSPMA)
Steel Tank Institute (STI)
Steel Tube Institute of North America (STINA)
Steel Window Institute (SWI)
Submersible Water Pump Association (SWPI)
Sealant, Waterproofing and Restoration Institute (SWRI)

T

Tilt-up Concrete Association (TCA)
Tile Council of North America (TCNA)
Timber Framing Business Council (TFBC)
Tropical Forest Foundation (TFF)
Turf and Ornamental Communicators Association (TOCA)
Turfgrass Producers Council (TPC)
Tube and Pipe Association International (TPA/FMA)
Truss Plate Institute (TPA)

U

Underwriters Laboratories, Inc. (UL)
United Lightening Protection Association (ULPA)
Uni-Bel PVC Pipe Association (UNI)
U.S. Department of Agriculture (USDA), Forest Products Laboratory
U.S. Consumer Products Safety Commission (CPSC)
U.S. Green Building Council (USGBC)
U.S. Environmental Protection Agency (USEPA)
U.S. General Services Administration (USGSA)
U.S. National Committee of the International Commission on Illumination (USNC/CIE)
United States Sign Council (USSC)
United States Pharmacopoeial Convention (USP)
United States Tennis Court and Track Builders Association (US&TCBA)

V

Valve Manufacturers Association of America (VMA)
Vinyl Siding Institute (VSI)

W

Wallcoverings Association (WA)
West Coast Lumber Inspection Bureau (WCLIB)
Window Covering Manufacturers Association (WCMA)
Window and Door Manufacturers Association (WDMA)
Women Construction Owners and Executives U.S.A. (WCOE)
Wire Fabricators Association (WFA)
World Forrest Association (WFA)
World Floorcoverings Association (WFCA)
Western Hardwood Association (WHA)
Western Wall and Ceiling Contractors Association (WWCCA)
Wiring Harness Manufacturers Association (WHMA)
Woodwork Institute (WI)
Warnock Hersey, Inc. (WH) is now part of Intertec Testing Services (ITS)
Wood Molding and Millwork Producers Association (WWMPA)
Wood Products Manufacturers Association (WPMA)
World Squash Federation (WSF)
Western Red Cedar Lumber Association (WRCLA)
Wire Reinforcement Institute (WRI)
Water Systems Council (WSC)
Western States Clay Products Association (WSCPA)
Wood and Synthetic Flooring Institute (WSFI)
Western States Roofing Contractors Association (WSRCA)
Wood Truss Council of America (WTCA)

Western Wood Products Association (WWPA)
Woven Wire Products Association (WWPA)

X

None

Y

None

Z

None

3. EXECUTION:

Not Used

* * *

QUALITY ASSURANCE Section 01 43 00

1. GENERAL:

A. DESCRIPTION:
1. General: This section includes administrative and procedural requirements for quality assurance.
2. Workmanship: Quality of work.
3. Tolerances: Finished surfaces.
4. Protection of Wood: Moisture and damage.

B. REFERENCES:
1. General: Refer to Section 01 42 00 - REFERENCES. Products or workmanship specified in the Project Manual by association, trade, or other consensus standards shall conform to the requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
2. Contractual Relationship: The contractual duties and responsibilities of the parties of the Contract and those of the Architect shall not be altered from the requirements of the Contract Documents by any statement or inference in any reference document.

C. TESTING: Refer to Section 01 45 23 - TESTING AND INSPECTION SERVICES.

2. PRODUCTS:

A. GENERAL: Refer to Section 01 60 00 - PRODUCT REQUIREMENTS assure a consistent quality of products furnished by suppliers and manufacturers as indicated throughout the Project Manual.

3. EXECUTION:

A. PERFORMANCE
1. General: Refer to Section 01 73 10 - EXECUTION REQUIREMENTS.
2. Workmanship: Perform shop and field work with mechanics, craftspersons, artisans, and workers skilled and experienced in the fabrication and installation of work specified. Install and erect work plumb, level, square, and true, or true to indicated angle, and in proper alignment and relationship to other work. Finished work shall be free from defects and damage. Quality of work shall conform to the highest established standards and practices of the various trades required. The City reserves the right to reject materials and work quality which does not meet accepted standards. Repair or replace substandard material or work as directed, at no additional cost to the City.

B. INSTALLATION
1. General: Conduct quality control in concert with suppliers, products, services, site conditions, and workmanship, to produce work of specified quality.
2. Manufacturer's Instructions:
   a. General: Follow manufacturer's instructions, including each step in progression of installation. If manufacturer's instructions conflict with Contract Documents, request clarification from City before commencing Work.
   b. Installer: Manufacturer approved, as required in the technical sections of the Project Manual.
   c. Field Services: Coordinate with manufacturer of a product, system, or assembly which requires special knowledge and skill for proper application/installation of the product, system, or assembly to obtain field service, consultation and inspection as required for the application/installation work at no additional cost to the City.
3. Reference Standards: Conform to specified standards as minimum quality for the Work except where more stringent codes or specified requirements indicate higher standards or more precise workmanship.
4. Anchorage: Secure products in place with positive anchorage devices designed and sized to withstand stress, vibration, physical distortion, or disfigurement.
5. Tolerances:
   a. General: Adjust products to appropriate dimensions; position before securing in place. Monitor and control tolerances of installed products to produce acceptable Work.
   b. Finished Wall Surfaces: Plumb; maximum variation of 1/8 inch in 8'-0" when a straightedge is laid on the surface in any direction, and no measurable variation in any 2'-0" direction.
   c. Finished Ceiling Surfaces: True and level; maximum variation of 1/8 inch in 8'-0" when a straightedge and water level are laid on the surface in any direction, and no measurable variation in any 2'-0" direction.
   d. Floor Surfaces:
      1. Concrete Floors: Tolerances for concrete floors and pavement are specified in Section 03 30 00 - CAST-IN-PLACE CONCRETE.
      2. Finished Floors: Level to within plus or minus 1/8 inch in 10'-0" for resilient floor coverings.

6. Protection of Wood:
   a. General: Provide protection of wood materials and products, whether or not installed, including erected and installed wood framing and sheathing, from water and moisture until completion and acceptance of the Project. Keep informed of weather conditions and forecasts and, when there is a likelihood of rain, protect installed and exposed framing and sheathing and stored lumber exposed to the elements with suitable water-repellent coverings, such as canvas/tarpaulins or polyethylene sheeting.
   b. Finish Materials: Keep millwork and trim, paneling, cabinets, shelving, and products manufactured from wood under cover and dry at shop until time of delivery. Do not deliver fabricated finish materials to the site until the building is roofed, and exterior walls are sheathed and protected with building paper as a minimum, the doors and windows are installed and glazed, and there is ample interior storage space for such materials and products. Do not deliver during periods of rain or heavy fog.
   c. Moisture Damage: Wood materials or products which become wet from rain, dew, fog, or other source will be considered to have moisture damage and will be rejected, requiring replacement by the Contractor with new, dry materials or products at no additional cost.

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TESTING AND INSPECTION SERVICES Section 01 45 23

1. GENERAL:

A. DESCRIPTION: This section includes administrative and procedural requirements for testing laboratory services for inspections, tests, and related actions, including reports prepared by Contractor, by independent agencies, and by governing authorities.

B. TESTING LABORATORY:
   1. General: Contractor shall employ and pay for services of an independent testing laboratory to perform specified testing.
   2. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
   3. Cooperation: Cooperate with laboratory to facilitate required services.
   4. Performance of Work: Employment of laboratory shall not relieve Contractor's obligations to perform work of Contract.

C. INSPECTION SERVICES: Refer to General Provisions.

D. REQUIREMENTS:
   1. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.
   2. Respective Sections of the Specifications: Certification of products.
   3. Listed Specification Sections: Laboratory tests required and standards for testing.
   4. Testing Laboratory Inspection, Sampling and Testing is required for:
      a. Concrete Reinforcement: Section 03 20 00 - CONCRETE REINFORCING.
      b. Cast-in-Place Concrete: Section 03 30 00 - CAST-IN-PLACE CONCRETE.
      c. Concrete Unit Masonry: Section 04 22 00 - CONCRETE UNIT MASONRY.
      d. Structural Steel: Section 05 12 00 - STRUCTURAL STEEL FRAMING.
      e. Earthwork: Section 31 20 10 - EARTHWORK.
      f. Asphalt Concrete Paving: Section 32 12 16 - ASPHALT PAVING.

2. PRODUCTS:

A. SUBMITTALS:
   1. General: Refer to Section 01 33 10 - SUBMITTALS.
   2. Testing Laboratory: Submit electronic copy (PDF) of certified written report, of each inspection, test, or similar service.

3. EXECUTION:

A. LABORATORY DUTIES:
   1. General: Comply with ASTM E329 "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".
   2. Cooperation: Cooperate with City, Engineer and Contractor; provide qualified personnel after due notice.
   3. Services:
      a. General: Perform specified inspections, sampling and testing of materials and methods of construction.
      b. Specified Standards: Verify compliance.
      c. Specified Materials: Ascertain compliance with requirements of Contract Documents.
   4. Notification: Promptly inform City and Engineer of observed irregularities or deficiencies of work or products.
   5. Reports: Submit as required.
   6. Additional Testing: Perform additional tests as required by City.

B. LIMITATIONS OF AUTHORITY OF TESTING LABORATORY: Laboratory is not authorized to release, revoke, alter or enlarge on requirements of Contract Documents, or perform any construction duties of Contractor.

C. CONTRACTOR'S RESPONSIBILITIES:
   1. Cooperation:
      a. Scheduling: Notify laboratory sufficiently in advance of operations, as specified under individual Sections of the specifications, to allow laboratory to schedule tests and assign personnel. When tests or inspections cannot be performed after such notice, reimburse City for laboratory personnel and travel expenses incurred.
      b. Laboratory Personnel: Cooperate with, provide access to Work, and to manufacturer's operations.
      c. Inspector: Cooperate with Inspector to secure and deliver to laboratory adequate quantities of representative samples of materials proposed for use and that require testing.

2. Manufacturer's Test Reports: Furnish copies of products test reports as required.
3. Incidental Labor and Facilities: Provide access to Work to be tested; facilitate inspections and tests.
4. Additional Testing: Paid for by City and backcharged to Contractor as specified in the individual sections.
5. Repair and Protection: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Refer to Section 01 73 29 - CUTTING AND PATCHING.

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TEMPORARY FACILITIES AND CONTROLS Section 01 50 00

1. GENERAL:

A. DESCRIPTION: Furnish and install temporary facilities and controls as specified, plus other unspecified temporary facilities, including labor, materials, services, utilities, and equipment, as may be required for proper performance of the contract, except as otherwise provided.

B. RELATED WORK SPECIFIED ELSEWHERE:
   1. Earthwork: Section 31 20 10 - EARTHWORK.
   2. Permanent Utilities: Pertinent specification Sections.

C. REQUIREMENTS OF REGULATORY AGENCIES:
   1. General: Temporary facilities and controls shall be approved by appropriate authorities and regulatory agencies, including insurance companies, for safety precautions, operation and fire hazard.
   2. Associated General Contractors of America (AGC): "Manual of Accident Prevention in Construction".
   3. California Occupational Safety and Health Administration (CalOSHA): Construction Safety Orders; 29 CFR, PART 1926 Safety and Health Regulations for Construction.
   4. California Division of Occupational Safety and Health (DOSH): Title 8 - Construction Safety Orders.

D. PRODUCT HANDLING:
   1. Protection: Protect and maintain temporary facilities and controls in proper and safe condition throughout progress of work.
   2. Replacements: Immediately repair or replace lost or damaged temporary facilities or controls.

2. PRODUCTS:

A. TEMPORARY UTILITIES: Provide water, electricity, gas and other specified utility services required during construction and extend service lines to construction areas; allow use by all trades.
   1. Temporary Water:
      a. General: Provide and pay for ample supply of potable water from sources off site.
      b. Temporary Connections: Provide connections to source and sufficient hose or pipe to carry water to all required locations.
   2. Temporary Electrical Facilities:
      a. General: Provide temporary electrical power and facilities necessary to supply lighting for work operations and power for power driven tools and testing.
      b. Construction Requirements:
         1. General: Construct and maintain temporary electrical facilities per requirements of the utility company providing service. Provide electrical materials, devices, and equipment that are in good and safe condition as follows:
         2. Division of Industrial Safety: "Electrical Safety Orders".
         3. Public Utilities Commission: "Rules for Overhead Line Construction".
      c. Electrical Service: Make application for temporary service from serving utility company and pay for electric service and energy used.
      d. Interior Lighting: Provide and maintain at a minimum level of two (2) watts per square foot, as required.
   3. Temporary Heat and Ventilation:
      a. General: Provide heat and ventilation as required to protect work and materials and reduce humidity to extent required to prevent corrosion of metal, dampness or mildew that may damage materials and finishes; fuel, equipment and method of heating and ventilating shall be acceptable to City.
      b. Finishing: Provide heat to produce temperature of not less than 70° F for seven (7) days prior to placement of interior finish materials and throughout period of installation of gypsum board, laying of resilient flooring materials, and painting.
      c. Acceptance: Maintain building temperature of not less than 60° F after finishing is complete and until final acceptance or occupancy by City.
   4. Telephone:
      a. General: Maintain telephone in field office for the use of the Contractor, and a separate telephone for the use of the City and Inspectors for duration of operations under this Contract. Provide and pay service charges for a cellular telephone and/or pager for use of Contractor's Superintendent.
      b. Availability: Provide access to telephone service for subcontractors and suppliers for duration of construction.
      c. Facsimile Machine (FAX): Provide acceptable telecopier device; provide access as necessary to expedite construction.
      d. Internet Access: Provide high-speed wireless internet access and e-mail capability at the job

site.

B. FIELD OFFICE:
   1. General: Provide acceptable construction trailer or temporary construction with floor raised above grade; waterproof, weathertight, and well lit and ventilated, including separate office space of sufficient size for City and Inspector. Equip with shelves, desks, filing cabinet, chairs, and such other items of equipment needed. Office and equipment is the property of the Contractor and must be removed from the site upon completion of work.
   2. Utilities: Provide electric lighting and power; make adequate provisions for heating and cooling.

C. SANITARY FACILITIES:
   1. Toilet Facilities: Provide enclosed chemical toilets with urinal for use of personnel engaged on Project.
   2. Drinking Water Facilities: Provide adequate clean and sanitary drinking water.

D. CONSTRUCTION EQUIPMENT:
   1. General: Erect, equip, operate, and maintain construction equipment per applicable statutes, laws, ordinances, rules, and regulations of jurisdictional authorities and insurance companies regarding safety, operation and fire hazard.
   2. Construction Access Equipment:
      a. General: Provide and maintain scaffolding, staging, runways, and similar equipment, as required. Coordinate furnishing and use with subcontractors.
      b. Vertical Transportation: Provide and maintain hoists per Safety Orders of State of California, Division of Industrial Safety, until work is completed or until no longer required under this Contract.

E. ENCLOSURES, FENCING AND BARRICADES:
   1. General: Provide and maintain barricades, fencing, shoring, pedestrian walkways including lights and other safety precautions to guard against personal injury and property damage as prescribed by jurisdictional authorities, including insurance companies.
   2. Safety Orders: Obtain copies and conduct work under the requirements of applicable Safety Orders issued by State of California, Division of Industrial Safety. Inform subcontractors and material suppliers as to the requirements of applicable Safety Orders.
   3. Contractor's Storage Area: Locate where shown; enclose with fences and gates as required for security.

F. TEMPORARY SIGNS:
   1. Project Sign: Refer to General Provisions.
   2. Other Signs: Not permitted; Contractor's name may be placed on field office and equipment.

G. SITE CONTROLS AND PARKING:
   1. Entrance to Work Site: Use identified entrances and access roads, as shown, or as directed. Maintain roads in satisfactory condition during Contract; repair damage resulting from work of this Project, as required, to leave in condition equal to that existing at start of Work.
   2. Site Storage and Work Areas: On-site storage and work areas will be identified by the City, for the Contractor's use, subject to change as necessary as job progresses.
   3. Regulations: Observe and comply with rules and regulations in effect at occupied facilities, including parking and traffic regulations, security restrictions, hours of access, and the like.
   4. Use of Public Sidewalks and Streets: Make arrangements with civic authorities for temporary use of streets and sidewalks for offices, shops, storage, etc.; abide by rules, regulations and ordinances; obtain and pay fees for permits.
   5. Debris Control: Keep work and storage areas clean and free of debris. Dispose of debris off site as it accumulates; pay required fees for use of dumps. Burning or burying on site is prohibited.
   6. Dust Controls:
      a. Indoor Operations: Control dust by using temporary partitions, curtains, or other means to prevent its spread beyond immediate work area. Use temporary means of closure for ducts and other openings communicating with other parts of building.
      b. Outdoor Operations: Use sprayed water to control dust from outdoor operations, as required.
   7. Noise Control: Minimize noise caused by work operations. To extent possible, schedule accomplishment of noisy construction operations to hours during which adjacent building occupants will be least inconvenienced.
   8. Dewatering Facilities: Provide and maintain pumping facilities to keep site reasonably dry; protect materials and installed work from water damage until dewatering is no longer required.
   9. Security: Contractor is responsible for security of areas of Work during entire time of Contract. Repair damage to Work and replace materials lost due to vandalism or theft.
   10. Drainage: As required by the State of California Water Resources Control Board, only rainwater is permitted in storm drain system. Do not permit water resulting from washing of equipment or other construction activities to be discharged into the storm drainage system. Provide temporary containment, sediment traps, and/or gravel filters to prevent discharge of non-storm water into storm drain system.

3. EXECUTION:

A. MAINTENANCE AND REMOVAL: Maintain temporary facilities and controls as long as required for safe and proper completion of Work; remove temporary facilities and controls as rapidly as progress of Work will permit.

* * *

PRODUCT REQUIREMENTS Section 01 60 00

1. GENERAL:

A. DESCRIPTION:
1. General: This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
2. Submittals: Product lists.
3. Quality Assurance: References, source limitations, compatibility of options and nameplates.
4. Product Options: Products specified by reference standards, specified products, alternate manufacturers, approved equals, and required products.
5. Product Handling: Procedures.

B. RELATED WORK:
1. General: The following items of Work are related to the Work of this Section but specified elsewhere in this Project Manual.
2. Alternates: Refer to Section 01 23 00 - ALTERNATES.
3. Closeout: Refer to Section 01 77 00 - CLOSEOUT PROCEDURES.

C. DEFINITIONS:
1. Products:
a. General: Items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
b. Named Products: Items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
2. Materials: Components shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. Equipment: Product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

D. SUBMITTALS:
1. General: Refer to Section 01 33 10 - SUBMITTALS.
2. Products List: Within thirty-five (35) days after award of contract, submit complete list of products intended for use on this Project. Provide list tabulated by Section Number, giving the trade name, name of the manufacturer, and model number or catalog designation of each product. Include products specified by reference standards and alternate products proposed for substitution (refer to General Provisions.)

E. QUALITY ASSURANCE:
1. General: Refer to Section 01 43 00 - QUALITY ASSURANCE.
2. Reference Standards: Refer to Section 01 42 00 - REFERENCES.
3. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
4. Compatibility of Options: When the Contractor is given the option of selecting between two (2) or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
5. Nameplates:
a. General: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.
b. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
c. Equipment: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces.

2. PRODUCTS:

A. GENERAL: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

B. PRODUCT OPTIONS:
1. General: For purposes of this Project products have been specified with the following options:
2. Products Specified by Reference Standards: Contractor may select any product which meets the standards, by any manufacturer.
3. Specified Products and Alternate Manufacturers: Wherever catalog numbers and specific brand or trade names are used in conjunction with a designated material, product, thing or service mentioned in these specifications, they are used to establish the standards of quality, utility and appearance required. The "specified product" shall be understood to be the basis for the project

design. Comparable products of named "alternate manufacturers" shall be considered equal in quality, utility and appearance. Contractor has the option of selecting from products and manufacturers named and must satisfy submittal requirements specified in Section 01 33 10 - SUBMITTALS.

4. Approved Equal: Where specification includes the designation "or approved equal", Contractor may request acceptance as "equal" any material, process, or product of unnamed manufacturer through use of the Substitution Request specified in Section 01 25 00 - SUBSTITUTION PROCEDURES. Requirements of that Section must be satisfied. Acceptance as "equal" will be the decision of the City; if the material, process or product is not, in the opinion of the City, equal in quality, utility and appearance to that specified, Contractor must furnish material, process or product specified.
5. Required Products: Where use of one named product and manufacturer is required to match others in use or because only one brand or trade name is known, there is no option, and no substitution will be allowed.

3. EXECUTION:

A. GENERAL: Refer to Section 01 73 10 - EXECUTION REQUIREMENTS.
B. PRODUCT HANDLING: Assure that Work is manufactured and/or fabricated in ample time so as to not delay construction progress. Transport, handle, store and protect products in accordance with manufacturer's instructions.

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EXECUTION REQUIREMENTS Section 01 73 10

1. GENERAL:

A. DESCRIPTION: This Section includes administrative and procedural requirements governing the Contractor's installation of products specified for use in the Project.
B. SUBMITTALS:
   1. Closeout: Refer to Section 01 77 00 - CLOSEOUT PROCEDURES.
C. QUALITY ASSURANCE:
   1. General: Refer to Section 01 43 00 - QUALITY ASSURANCE.
   2. Reference Standards: Refer to Section 01 42 00 - REFERENCES.
   3. Qualifications: Use installers specialized in the work required, as specified in the individual sections of the Project Manual.

2. PRODUCTS:

A. GENERAL: Refer to Section 01 60 00 - PRODUCT REQUIREMENTS.
B. PRODUCT HANDLING:
   1. Delivery: Schedule delivery of materials to the site at such time as required for proper coordination of the work. Receive materials in manufacturer's unopened packages and bearing manufacturer's label.
   2. Storage: Store materials in a dry and well-ventilated place, adequately protected from damage and exposure to the elements.

3. EXECUTION:

A. PREPARATION:
   1. Construction Layout:
      a. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
      b. Verification: Before beginning to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If deviations are observed, promptly notify City.
      c. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
      d. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
      e. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by City.
   2. Examination of Conditions: Carefully examine sub-surfaces before beginning work; report to City any defects. Starting of work implies acceptance of conditions as they exist.
   3. Environmental Requirements: Verify that ambient temperature and moisture content are within limits of material and equipment manufacturers' instructions. Perform interior finish work only after building is closed and temperature can be maintained above 50 degrees F.
   4. Examination: Examine conditions of work in place before beginning work; report defects.
   5. Measurements:
      a. General: Take field measurements; report discrepancies between plan and field dimensions to City.
      b. Templates: Obtain templates, patterns, and setting instructions as required; verify dimensions.
   6. Protection: Provide temporary protection and enclosures for floor and roof openings, stairways, and similar conditions. Provide adequate temporary centering, bracing, and shoring for protection of structure during construction. Protect non-ferrous metal work throughout construction period; protect materials from damage during adjacent construction activities.
B. INSTALLATION:
   1. General: Install products in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Embedded Items: Coordinate delivery and placement of items embedded in work.
   3. Operating Equipment: Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate Work of various contractors having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

4. Mechanical and Electrical:
   a. General: Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
   b. Pipes, Ducts, Conduit, Fixtures and Outlets: In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
5. Completion:
   a. General: Coordinate completion and clean up of Work of various subcontractors in preparation for Substantial Completion and for portions of Work designated for City's occupancy.
   b. Correction of Defective Work: After City occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of City's activities.

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CUTTING AND PATCHING Section 01 73 29

1. GENERAL:

A. DESCRIPTION: Provide all cutting, fitting and patching, including excavation and backfill as required per Section 31 20 10 - EARTHWORK, to complete the Work and to accomplish the applicable listed items.

B. LISTED ITEMS:
   1. Fitting: Make its several parts fit together properly.
   2. Untimely Work: Uncover portions of the Work to provide for installation of work not installed in the proper sequence of construction.
   3. Defective Work: Remove and replace defective and non-conforming work.
   4. Samples For Testing: Remove samples of installed work for testing per Section 01 45 23 - TESTING AND INSPECTION SERVICES and as identified in individual sections of the specifications.
   5. Mechanical and Electrical Penetrations: Provide penetrations of non-structural surfaces for installation of piping and conduit; refer to MECHANICAL and ELECTRICAL specifications.
   6. Existing Construction: Install specified work in existing Construction.

C. SUBMITTALS:
   1. Cutting and/or Alteration Request:
      a. General: Submit written request to the City in advance of executing any cutting or alteration to affected items as listed below.
      b. Affected Items: Work process of the City or any separate contractor; structural value or integrity of any element of the Project; integrity or effectiveness of weather-exposed or moisture-resistant elements or systems; efficiency, life, maintenance or safety of operational elements; visual qualities of sight-exposed elements.
      c. Request Requirements: Project name and location; description of all affected work; explanation of necessity for cutting, alteration or excavation; impact on the work of the City or any separate contractor, or on the structural or weatherproof integrity of the building; description of proposed work, including scope of cutting, patching, alteration, or excavation, products proposed to be used, trades who will complete the work, and extent of refinishing to be done; alternatives to cutting and patching; cost proposal, when applicable; written permission from any separate contractor whose work will be affected.
      d. Product Substitutions: Should conditions of Work or schedule indicate change of products from original installation, submit request for substitution as specified in Section 01 25 00 - SUBSTITUTION PROCEDURES.
      e. Field Observation: Submit written notice to City designating date and time work will be uncovered.

2. PRODUCTS:

A. MATERIALS: Comply with requirements of individual sections of these Specifications for replacement of Work removed and type of work to be done.

3. EXECUTION:

A. INSPECTION:
   1. General: Inspect existing conditions; include elements subject to damage or movement during cutting and patching.
   2. After Uncovering Work: Inspect conditions affecting the installation of products, or performance of Work.
   3. Unsatisfactory Conditions: Report unsatisfactory or questionable conditions to the City in writing; do not proceed with work until City has provided further instructions.

B. PREPARATION:
   1. Temporary Support: Provide as necessary to assure structural value or integrity of affected portion of Work.
   2. Protection:
      a. General: Provide devices and methods to protect other portions of the Project from damage.
      b. Environmental Protection: Provide protection from elements for that portion of the Project which may be exposed by cutting and patching, and maintain excavations free from water.

C. PERFORMANCE:
   1. Excavation and Backfill: Execute excavating and backfilling by methods which will prevent settlement or damage to other work per Section 31 20 10 - EARTHWORK.
   2. Cutting and Patching: Perform work with workers skilled in the trades involved. Make patches, seams and joints durable and inconspicuous.
   3. Adjustment: Execute fitting and adjustment of products to provide a finished installation complying with specified products, functions, tolerances and finishes.

4. Fitting: Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
5. Restoration: Restore work which has been cut or removed; install new products to provide completed Work as shown and specified.
6. Refinishing: Refinish entire surfaces as necessary to provide even finish to match adjacent finishes; refinish continuous surfaces to nearest intersection; entire unit of any assembly.

* * *

CONSTRUCTION WASTE MANAGEMENT Section 01 74 19

1. GENERAL:

A. DESCRIPTION: Provide Construction Waste Management including salvaging, recycling, and disposing of nonhazardous construction waste, as shown and specified per Contract Documents.

B. DEFINITIONS:

1. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
2. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
3. Debris: Non-hazardous solid material generated during the construction, demolition, or renovation of a structure and which exceed 2.5 inch particle size, that is, a manufactured object, plant or animal matter, or natural geologic material (e.g. cobbles and boulders).
4. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
5. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.
6. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
7. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
8. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

C. PERFORMANCE REQUIREMENTS:

1. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 50% minimum (75% one goal, over 75% big goal) by weight of total waste generated by the Work. City's goal is to salvage and recycle as much nonhazardous construction waste as possible including the following:
2. Construction Waste:
   a. Site-clearing waste.
   b. Masonry and CMU.
   c. Lumber.
   d. Wood sheet materials.
   e. Wood trim.
   f. Metals.
   g. Roofing.
   h. Insulation.
   i. Carpet and pad.
   j. Gypsum board.
   k. Piping.
   l. Electrical conduit.
3. Packaging: Salvage or recycle 100 percent of the following uncontaminated materials:
   a. Paper.
   b. Cardboard.
   c. Boxes.
   d. Plastic sheet and film.
   e. Polystyrene packaging.
   f. Wood crates.
   g. Plastic pails.

2. PRODUCTS:

A. SUBMITTALS:

1. General: Refer to Section 01 33 10 - SUBMITTALS and 01 33 29 - SUSTAINABLE DESIGN REPORTING.
2. Waste Management Plan:
   a. General: Submit 3 (three) copies of plan within 7 (seven) days of date commencement of the Work. Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume; use same units of measure throughout waste management plan.
   b. Waste Identification: Indicate anticipated types and quantities of construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

c. Waste Reduction Work Plan:
   1. General: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
   2. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
   3. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
   4. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
   5. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   6. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

d. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

e. Cost/Revenue Analysis:
   1. General: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
   2. Total quantity of waste.
   3. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
   4. Total cost of disposal (with no waste management).
   5. Revenue from salvaged materials.
   6. Revenue from recycled materials.
   7. Savings in hauling and tipping fees by donating materials.
   8. Savings in hauling and tipping fees that are avoided.
   9. Handling and transportation costs. Include cost of collection containers for each type of waste.
   10. Net additional cost or net savings from waste management plan.

f. Forms: Prepare waste management plan on forms included at end of Part 3.

3. Waste Reduction Progress Reports: Submit electronic copy (PDF) of report. Identify in submittal the material categories, generation point of the waste and total quantity of salvaged plus recycled waste recovered in .

4. Waste Reduction Calculations:
   a. General: Before request for Substantial Completion, submit 3 (three) copies of the following:
   b. Calculated end-of-Project Rates: Identify salvage, recycling, and disposal rates as a percentage of total waste generated.
   c. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
   d. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
   e. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
   f. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
   g. LEED Submittal: LEED letter template for Credit MR 2.1, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
   h. Qualification Data: For Waste Management Coordinator.

B. QUALITY REQUIREMENTS:
   1. General: Refer to Section 01 43 00 - QUALITY ASSURANCE.
   2. Reference Standards:
      a. General: Refer to Section 01 42 00 - REFERENCES for reference standards, applicable codes and definitions.
      b. American National Standards Institute (ANSI): ANSI 10.2 - Safety Code for Building Construction.
      c. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers standard specifications.
      d. California Occupational Safety and Health Administration (CalOSHA): Construction Safety

Orders; 29 CFR, PART 1926 Safety and Health Regulations for Construction.
e. California Integrated Waste Management Board: Sustainable Building Guidelines
f. U.S. Green Building Council (USGBC): LEED-BD+C Rating System.

3. Qualifications:
   a. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council.
   b. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
4. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
5. Waste Management Conference:
   a. General: Conduct conference at Project site to comply with requirements in Section 01 31 00 - PROJECT MANAGEMENT AND COORDINATION. Review methods and procedures related to waste management including, but not limited to, the following:
   b. Waste Management Coordinator: Review and discuss waste management plan including responsibilities.
   c. Quantities and Disposition: Review requirements for documenting quantities of each type of waste and its disposition.
   d. Material Separation: Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   e. Collection and Transportation: Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   f. Waste Management: Review requirements for each trade.

3. EXECUTION:

A. PERFORMANCE: Refer to Section 01 73 10 - EXECUTION REQUIREMENTS.
B. PREPARATION:
   1. General: Implement approved waste management plan;. Provide handling, containers, storage, signage, transportation, and other items as required; refer to Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.
   2. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management plan.
   3. Training: Train workers, subcontractors, and suppliers on proper waste management procedures. Review Waste Management Plan procedures and identify locations established for salvage, recycling, and disposal.
   4. Site Access and Temporary Controls: Conduct waste management operations with minimum interference with roads, streets, walks, walkways, and adjacent occupied facilities. Designate and label specific areas on the site for separating materials to be salvaged, recycled, reused, donated, and sold.
C. IMPLEMENTATION:
   1. Recycling:
      a. General: Proceeds, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
      b. Procedures:
         1. General: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
         2. Containers: Provide properly marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin. Inspect containers and bins for contamination and remove contaminated materials if found.
         3. Stockpiling: Collect and process materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust. Store materials away from construction area, off the ground and protect from the weather; do not store within drip line of remaining trees.
         4. Removal: Transport recyclable waste off City's property to recycling receiver or processor.
   2. Construction Waste:
      a. Packaging:
         1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
         2. Polystyrene Packaging: Separate and bag materials.
         3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. Pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
         4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

b. Site-Clearing Wastes: Chip brush, branches, and trees at landfill facility.
c. Wood:
   1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
   2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
d. Gypsum Board: Store large clean pieces in a dry location. Recycle off site.

3. Disposal:
   a. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   b. Burning and Burying of Materials: NOT ALLOWED.
   c. Disposal of Materials: Transport waste materials off City's property and legally dispose of them.

* * *

Project Name: Fire Station No. 5
Date: ____________________

Waste Diversion Tracking

Date	Material Type	Method of Diversion (Recycled/ Reused/ Donated)	Amount Landfilled (tons/cy)	Diverted Materials (tons/cy)

CLOSEOUT PROCEDURES Section 01 77 00

1. GENERAL:

A. DESCRIPTION: Perform operations necessary for and incidental to closing out the Contract and assisting in obtaining Project acceptance by the City.

B. FINAL CLEANING:
1. General: Remove marks, stains, fingerprints, dust, dirt, and paint drippings resulting from work of this Project. Wash tile, plumbing and other fixtures clean; polish hardware and other unpainted metals. Remove temporary labels, tags and paper covering.
2. Finish Surfaces: Perform specified cleaning, polishing, sealing, waxing, and other finish operations required for acceptance of work by the City.
3. Glass: Employ professional window cleaners to clean glass, mirrors and plastic surfaces of putty, paint materials, stains and dirt, as specified. Leave work bright, clean and polished.

C. CLOSEOUT SCHEDULE AND PROCEDURE:
1. Requirements Preparatory to Project Acceptance:
   a. Certifications: Deliver to City separate written certifications as required in Section 01 33 10 - SUBMITTALS stating that no materials containing asbestos has been installed in the Work, and that materials used in construction operations and installed in the Work comply with the volatile organic compound (VOC) requirements.
   b. Temporary Facilities: Remove from site per Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.
   c. Cleaning: Complete thorough building and site cleaning per Document 00 70 00 - GENERAL CONDITIONS, Article 1.2 of this Section, and the individual sections of the specifications.
   d. Adjustments:
      1. General: As required in the various technical sections of this Project Manual.
      2. Plumbing and Mechanical Equipment: Assure that equipment operates quietly and free from vibration. Properly adjust, repair, balance, or replace equipment producing objectionable noise or vibration in occupied areas of building; provide additional brackets, bracing, etc., to prevent such objectionable noise or vibration.
      3. Systems: Assure that all operate without humming, surging, or rapid cycling; balance reports are required before Mechanical Engineers will prepare "punch lists".
   e. Extra Stock: Deliver one (1) percent or a minimum of one full container of each kind and type of interior or unit finish material installed, unless otherwise specified. Package materials with protective covering and identify with labels describing contents.
   f. Affidavits: Submit affidavits of release of liens, payment of debts and claims and all applicable taxes.

2. PRODUCTS:

A. RECORD DRAWINGS:
1. General: Record drawings shall be kept up-to-date at all times. Verify that record drawings accurately show work completed to date before approval of pay requests.
2. Drawings:
   a. General: City will furnish required documents in reproducible medium to the Contractor.
   b. Locations: At time of installation, record installed locations of underground, drainage, plumbing and electrical work, including storm drain grate and invert elevations on prints.
   c. Documentation:
      1. General: Transfer installed locations to reproducible medium and submit documents to City.
      2. Identification of Changes: Information entered on reproducible documents shall be neat, legible and emphasized by drawing "clouds" around changed items.
      3. Dimensions: Locate work, including stubs for future connections, with reference to permanent landmarks or buildings and indicate depth below finish grade.
      4. Symbols and Designations: Use same as shown on Contract Drawings.
3. As-Built Survey: Prepared by Registered Land Surveyor in reproducible medium as required by Section 31 20 10 - EARTHWORK.
4. Certification: Completed Record Drawings shall be signed by Contractor as complete and accurate records of the Project, as built.

B. OPERATION AND MAINTENANCE INSTRUCTIONS:
1. General: Incorporate in Maintenance/Operating Manual(s), as specified below, brochures, manufacturer's catalogs and written instructions for equipment and materials needing regular care or maintenance; i.e., carpets, resilient flooring, architectural finishes, mechanical and electrical equipment, etc. Provide one (1) complete copy of each manual required and electronic copy (PDF) of contents.

2. Manual:
   a. General: Prepare manuals using durable plastic loose leaf binders approximately 8-1/2 x 11 inches in size with following minimum data:
   b. Identification: On, or readable through, a front cover stating general nature of manual.
   c. Index: Neatly typewritten at front of manual; **clearly identify location of emergency data.**
   d. Operation and Maintenance Data: Complete instructions for products and equipment required.
   e. Repair/Replacement Parts: Provide name and address of nearest vendor for replacement of parts or repair services.
   f. Additional Data: Where contents of manuals include manufacturer's catalog pages, clearly indicate precise items included in this installation and delete, or otherwise clearly indicate, manufacturer's data which is not in this installation.
3. Operating Instructions: Mount and post instructions for equipment, as required.
4. Service and Maintenance Contracts: As specified, executed by each subcontractor, manufacturer, and supplier as applicable.

C. GUARANTEES:
1. General: Provide in conformance with the requirements of Document 00 70 00 - GENERAL CONDITIONS and as required in the individual sections of this Project Manual.
2. Guarantee Period: Duration of the guarantees shall be as stated in the individual sections of this Project Manual. Guarantee periods shall commence on the official date of acceptance by the City of the Project.
3. Submittal: Submit required Guarantees on electronic copies (PDFs) of Guarantee Form included at the end of this Section and deliver in a complete package to the City.

3. EXECUTION:

A. PROJECT ACCEPTANCE:
1. General: Notify City when Contractor considers the Project complete enough to prepare a punch list. City will then notify Mechanical and Electrical Engineers to make inspections and prepare their punch lists, which must be completed before City will conduct inspection to determine if project is substantially complete in accordance with Construction Contract.
2. Notification: After requirements preparatory to project acceptance have been completed, Contractor shall notify City in writing that the Work is ready for final inspection; provide minimum three (3) days' advance notice of desired date for inspection.
3. Final Inspection: Contractor, or his agent authorized to act in his behalf, shall accompany the City on the final inspection, as well as any principal subcontractors requested by the City.

* * *

GUARANTEE FORM

Guarantee for _____

We hereby guarantee that the workmanship and materials that we installed in the Fire Station No. 5 have been in accordance with the Drawings and Project Manual and that the work as installed will fulfill the requirements of the guarantee included in the Project Manual. We agree to repair or replace any or all work, together with any other adjacent work that we may displace in so doing, that may prove to be defective in its workmanship or material within a period of _____ (____) years from date of acceptance by the City, without any expense whatsoever to City, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of our failure to comply with the above-mentioned conditions within ten (10) days after being notified in writing by the City, we collectively or separately do hereby authorize City to proceed to have said defects repaired and made good at our expense and we will honor and pay the costs and charges therefor upon demand.

SUBCONTRACTOR:

_____
Signed Date

_____
Name Title

_____
Company Name License No.

_____
Address

GENERAL CONTRACTOR:

_____
Countersigned Date

_____
Name Title

_____
Company Name License No.

_____
Address

* * *

7. Schedule

The following table summarizes the general schedule for commissioning activities. This schedule will be periodically updated:

Task / Activity	Estimated Date
Owner designates commissioning agent	
CA submits draft Commissioning Plan	February 2013
Design team reviews draft Commissioning Plan	March 2013
Kickoff meeting with design team	
Owner submits Owner's Project Requirements	February 2013
CA reviews Owner's Project Requirements	March 2013
Design team submits Basis of Design	October 2012
CA reviews Basis of Design	November 2012
CA develops commissioning specifications / requirements	January 2013
Contractor provides CA with submittals for commissioned systems	
CA reviews contractor submittals for commissioned systems	
Construction phase commissioning kickoff meeting	
CA submits draft prefunctional checklists	
Contractor reviews draft prefunctional checklists and comment	
CA incorporates comments and issues final prefunctional checklists	
Contractor executes prefunctional checklists	
CA develops / provides draft functional performance test procedures	
Contractor reviews draft functional performance test procedures	
CA incorporates comments and issues final functional performance test procedures	
CA, Contractor and Sub-Contractors execute Functional Performance Test Procedures	
CA submits Final Commissioning Report	
LEED consultant submits LEED package	

APPENDIX G

SDG&E LEGAL AND PLAT EASEMENT

J-16631A

EXHIBIT "A"

SDG&E EASEMENT

Those portions of Lots 7, 8, and 9 in Block C of Estudillo and Capron's Addition in the City of San Diego, County of San Diego, State of California, according to Map thereof No. 650 filed in the Office of the County Recorder of San Diego County December 4, 1890, being more particularly described as follows:

Beginning at a point in the South line of said Block C of Map No. 650 which bears North 89°44'29" East 19.67 feet from the Southwest Corner of said Lot 7 in Block C of Map No. 650; thence along said South line South 89°44'29" West 6.11 feet; thence leaving said South line North 11°04'54" West 64.33 feet; thence North 00°10'59" West 5.33 feet; thence North 89°49'01" East 8.50 feet; thence South 00°10'59" East 2.01 feet; thence South 84°49'46" East 52.84 feet; thence South 00°11'30" East 6.03 feet; thence North 84°49'46" West 54.75 feet; thence South 11°04'54" East 61.75 feet to the **TRUE POINT OF BEGINNING.**

Containing 753.906 Square Feet, more or less.

Attached hereto is Exhibit "B" and by reference made a part hereof.

7-7-2014

Patrick A. McMichael, L.S. 6187 Date

Ec:k:files_16631a_SDGE esmt

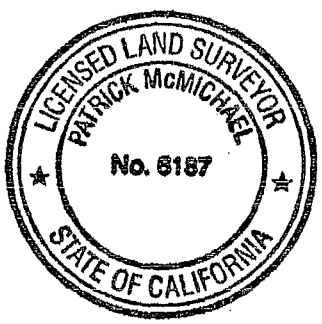
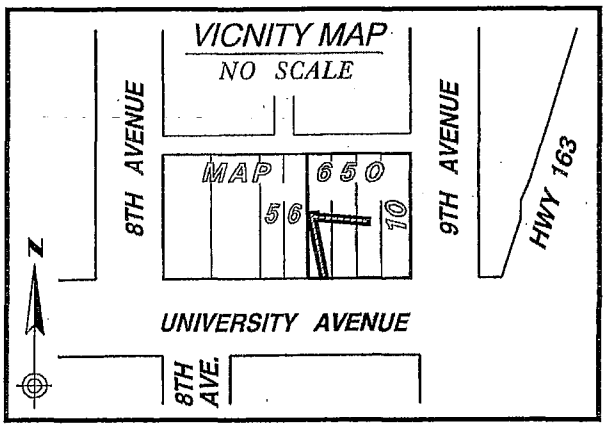


EXHIBIT 'B'

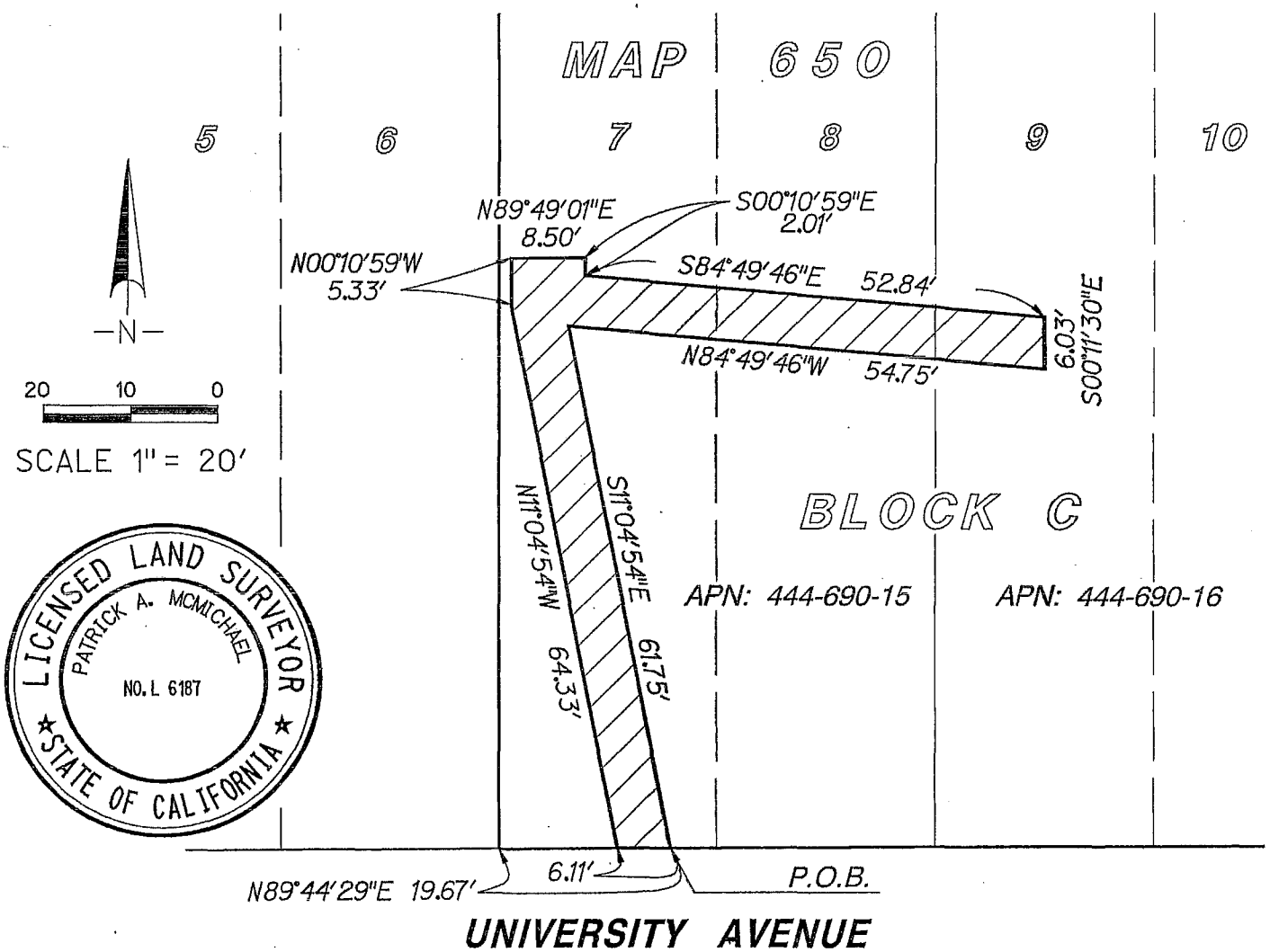
SHEET 1 OF 1



LEGEND

SDG&E EASEMENT ACQUIRED HEREON 753.906 SQ. FT.

P.O.B. POINT OF BEGINNING



LICENSED LAND SURVEYOR
PATRICK A. McMICHAEL
NO. L 6187
STATE OF CALIFORNIA

RICK ENGINEERING COMPANY
5620 FRIARS ROAD J. 16631-A
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165

PATRICK A. McMICHAEL, LS 6187 — DATE 7-7-2014

SDG&E EASEMENT

OVER THOSE PORTIONS OF LOTS 7, 8 AND 9 IN BLOCK C OF MAP NO. 650

M:\16631\Survey\Easement\16631_SDGE_exb_01.dgn
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APPENDIX H

ASBESTOS REPORT AND HRB HISTORICAL DETERMINATION

THE CITY OF SAN DIEGO

M E M O R A N D U M

DATE: July 27, 2010

TO: Yousef Ibrahim, Associate Civil Engineer, Engineering & Capital Projects; Architectural Engineering and Parks Division

FROM: Robert Cox, Asbestos & Lead Program Inspector
via Alan J. Johanns, Asbestos & Lead Program Manager, Environmental Services Department; Energy, Sustainability, and Environmental Protection Division

SUBJECT: Asbestos and lead inspection for Fire Station 5

Per your request, the Asbestos and Lead Management Program (ALMP) performed asbestos and lead sampling in preparation of demolition of Fire Station 5, located at 3902 9th Ave on June 24, 2010.

An ALMP records search found previous asbestos survey results performed in 2002 and before for this facility and its additions. Records indicated asbestos containing roofing mastic was abated in 2004, but samples were collected of the new mastic materials during this inspection to verify it did not contain asbestos.

The June 24, 2010 inspection consisted of sampling materials that were not previously sampled and a visual assessment of previously identified asbestos containing materials to verify condition. This survey was nondestructive in nature and did not include materials concealed behind walls and hard ceilings. The following is a summary of the asbestos results:

Asbestos Summary

Fire Station #5 Asbestos Pre-existing Sample Results

SAMPLE #	TYPE OF MATERIAL	LOCATION	CONDITION	ASBESTOS (%)
5327-1A	wall plaster	bull pen	good	ND
5327-1B	wall plaster	battalion chief office	good	ND
5327-1C	wall plaster	dorm	good	ND
5327-2	black 9"x9" floor tile	bull pen, , Chiefs bathroom	good	1-4%

Other Hazardous Materials Summary
Based on previous survey results in 2002, approximately 90 mercury containing fluorescent light bulbs and 45 PCB containing ballasts are present.

Recommendations
Identified asbestos containing materials, lead containing materials and other hazardous materials as listed in this report must be removed prior to demolition. Because of the exterior brick coated with lead paint, I recommend that the abatement of the materials described above be included in the overall specification for this project vs. having the abatement work performed under a separate contract with the City's as-needed abatement contractor. ALMP can provide you the needed abatement technical language for your specification. ALMP should also review the general demolition specifications to ensure all work is done in accordance with applicable local state and federal regulations and to ensure there is no conflict with the abatement specification.

If you have any questions or are ready to proceed on this project and require the abatement portion of the specification, please contact me at 858-492-5015 or rcox@sandiego.gov.

Robert Cox
Asbestos and Lead Program Inspector

Attachments:
1. Asbestos Laboratory Results
2. Lead Paint Testing Results
3. Asbestos and Lead Report 8-28-02

memo2010\1412

PLM Report

Report No:	136686	**Customer:**	City of San Diego 9601 Ridgehaven Ct. #320 San Diego, CA 92123
Date:	June 29, 2010		
Date Received:	June 28, 2010		
Date Analyzed:	June 29, 2010	**Attention:**	Robert Cox
Date/Time Collected:	Jne 24, 2010 by Robert Cox	**Reference:**	PO#1078974; Project#6470
Subject:	Polarized Light Microscopy Analysis for Asbestos	3	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
1	NON-FRIABLE	BLACK/GRAY TAR LIKE	NONE DETECTED	CELLULOSE 15%	GRANULAR MINERALS, OPAQUES
2	NON-FRIABLE	GRAY SOLID	NONE DETECTED	NONE DETECTED	GRANULAR MINERALS, OPAQUES
3	NON-FRIABLE	BLACK TAR LIKE	NONE DETECTED	CELLULOSE 10%	OPAQUES

RECEIVED

JUL 06 2010

ENVIRONMENTAL SECTION

Wesene Sebhat, Optical Microscopist

B.M. Kolk, Laboratory Director

BMK/mt

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.

SUBMITTAL FORM / Laboratory Services

138686

PAGE 1 OF 2

TURNAROUND TIME: STD ____ 48 HR. X 24 HR. ____
<8 HR. ____ WKND ____ OTHER: ____

RELINQUISHED BY RC
TIME / DATE 6/25/10

CLIENT City of San Diego
ADDRESS 9601 Ridgehaven CT 310
San Diego, CA
TELEPHONE 858-492-5015
CONTACT Robert Cox

DATE OF SHIPMENT 6/25 CARRIER FX
CLIENT P.O. NO. ____
CLIENT JOB/PROJECT ID NO(S). 6470
PACKAGE SHIPPED FROM ____

RESULTS REQUESTED VIA VERBAL ☐ FAX ☐ E-MAIL ☒ E-MAIL RCox@SanDiego.go
(NOTE: Complete written reports will follow all analyses, in addition to any prior transmitted verbal, fax or e-mail results) FAX NO. ____

DATE/TIME OF SAMPLE COLLECTION 6/24/10
SAMPLE PRESERVATIVES ____ HOLDING TIMES ____
NO. OF SAMPLES SENT 3 SAMPLER'S NAME [signature] / Robert Cox
(SIGNATURE) (PRINTED)

TYPE: ☐ WATER ☐ WASTE WATER ☐ SOIL ☐ FILTER ☐ SORBENT TUBE ☐ IMPINGER ☐ OTHER PUR

(FOR EMS ONLY) EMS Sample No.	CLIENT SAMPLE NO.	DESCRIPTION/LOCATION/ANALYSIS	VOLUME/ TIME/WEIGHT (IF APPLICABLE)
138686-1	1	Roof Penetration Mastic	
2	2	Window Putty	
3	3	Roof Duct Mastic	

138686

Laboratory No. ____ Received By [signature] Time 905
Date of Package Delivery 10/26/10 Shipping Bill Retained: YES ☒ NONE ☐
Condition of Package on Receipt OK Condition of Custody Seal NONE
(NOTE: If the package has sustained substantial damage or the custody seal is broken, stop and contact the project manager and the shipper.)

No. of Samples 3 Chain-of-Custody Signature ____
Date of Acceptance into Sample Bank 10/26/10 Misc. Info. ____
Disposition of Samples PUR LABC

FOR EMS ONLY

PLM Report

Report No:	138861	**Customer:**	City of San Diego 9601 Ridgehaven Ct. #320 San Diego, CA 92123
Date:	July 13, 2010		
Date Received:	July 7, 2010		
Date Analyzed:	July 13, 2010	**Attention:**	Robert Cox
Date/Time Collected:	July 2, 2010 by Robert Cox	**Reference:**	PO#1078974; Project#6470
Subject:	Polarized Light Microscopy Analysis for Asbestos	3	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
6470-1 FT	NON-FRIABLE	BLACK GRANULAR	CHRYSOTILE - GREATER THAN 1%	NONE DETECTED	GRANULAR MINERALS, OPAQUES, RESIN
6470-1 M	NON-FRIABLE	BLACK TAR LIKE	NONE DETECTED	CELLULOSE - LESS THAN 1%	GRANULAR MINERALS, OPAQUES, ORGANICS
6470-2	NON-FRIABLE	WHITE PAINT, WHITE/GRAY GRANULAR	NONE DETECTED	NONE DETECTED	GRANULAR MINERALS, OPAQUES

Jeff Wan, Optical Microscopist

B.M. Kolk, Laboratory Director

BMK/mt

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.

138861

SUBMITTAL FORM/*Laboratory Services*

Rush T/A

PAGE 1 OF 1

TURNAROUND TIME: STD X 48 HR. 24 HR. <8 HR. WKND OTHER:

RELINQUISHED BY Robert Cox
TIME / DATE 7/2/2010

CLIENT The City of San Diego
ADDRESS 9601 Ridgehaven Ct, Suite 310
San Diego, CA 92123
TELEPHONE (858) 492-5015
CONTACT Robert Cox

DATE OF SHIPMENT 7/2/10 CARRIER Fed Ex
CLIENT P.O. NO.
CLIENT JOB/PROJECT ID NO(S). 6490
PACKAGE SHIPPED FROM

RESULTS REQUESTED VIA VERBAL ☐ FAX ☐ CLIENT FAX NO. **EMAIL: rcox@sandiego.gov
(NOTE: Complete written reports will follow all analyses, in addition to any prior transmitted verbal or fax results.)

DATE/TIME OF SAMPLE COLLECTION 7/2/2010
SAMPLE PRESERVATIVES HOLDING TIMES
NO. OF SAMPLES SENT 5 SAMPLER'S NAME (SIGNATURE) Robert cox (PRINTED)
TYPE: ☐ WATER ☐ WASTE WATER ☐ SOIL ☐ FILTER ☐ SORBENT TUBE ☐ IMPINGER ☒ OTHER PLM

(FOR EMS ONLY) EMS Sample No.	CLIENT SAMPLE NO.	DESCRIPTION/LOCATION/ANALYSIS	VOLUME/AREA/WEIGHT
138861-1	6490-1	Floor Tile & Mastic /Captains office	
	6490-2	Wall Plaster/ Kitchen	
	6490-3	Wall Plaster/ Kitchen	
	6490-4	Wall Plaster/ Kitchen	
5	6490-5	Floor Tile Mastic/ Chiefs office	

[SF 5/09]

138861

FOR EMS ONLY

Laboratory No.
Received By Meung Ung Time 9:34
Date of Package Delivery 7/7/10
Shipping Bill Retained: YES ☒ NONE ☐
Condition of Package on Receipt ok
Condition of Custody Seal None
(NOTE: If the package has sustained substantial damage or the custody seal is broken, stop and contact the project manager and the shipper.)
No. of Samples 5
Chain-of-Custody Signature
Date of Acceptance into Sample Bank 7/7/10
Misc. Info.
Disposition of Samples EMS Labs

EMS·LABORATORIES 117 West Bellevue Drive / Pasadena CA 91105-2503 / 626-568-4065

City of San Diego/Lead Safe Neighborhoods Program

64701

XRF Assay Results

Reading #	Time	Type	Duration	Units	Sequen	Component	Substrate	Side	Condition	Color	Site	Inspector	Room	Depth	Action	Pbc
25	6/24/2010 10:07	SHUTTER_CAL	128.66	cps	Final											2.89
26	6/24/2010 10:09	PAINT	7.6	mg / cm ^2	Final	calibration				red	208	rc		1.14	1	1.1
27	6/24/2010 10:09	PAINT	5.81	mg / cm ^2	Final	calibration				red	208	rc		1.11	1	1
28	6/24/2010 10:10	PAINT	10.74	mg / cm ^2	Final	calibration				red	208	rc		1.04	1	0.9
29	6/24/2010 10:10	PAINT	1.34	mg / cm ^2	Final	calibration				red	208	rc		1.19	1	1.1
30	6/24/2010 10:10	PAINT	0.23	mg / cm ^2	Final	calibration				red	208	rc		1.14	1	0.9
31	6/24/2010 10:11	PAINT	8.7	mg / cm ^2	Final	calibration				red	208	rc		1.13	1	1.1
32	6/24/2010 10:15	PAINT	3.81	mg / cm ^2	Final	wall	brick	B	INTACT	WHITE	208	rc	OUTSIDE	6.73	1	1.5
33	6/24/2010 10:15	PAINT	3.36	mg / cm ^2	Final	wall	brick	B	INTACT	WHITE	208	rc	OUTSIDE	4.92	1	1.8
34	6/24/2010 10:16	PAINT	3.56	mg / cm ^2	Final	wall	brick	B	INTACT	WHITE	208	rc	OUTSIDE	5.48	1	1.4
35	6/24/2010 10:17	PAINT	3.35	mg / cm ^2	Final	wall	brick	A	INTACT	WHITE	208	rc	OUTSIDE	3.9	1	1.5
36	6/24/2010 10:17	PAINT	1.77	mg / cm ^2	Final	wall	brick	A	INTACT	WHITE	208	rc	OUTSIDE	5.5	1	2.2
37	6/24/2010 10:17	PAINT	1.79	mg / cm ^2	Final	wall	brick	A	INTACT	TAN	208	rc	OUTSIDE	5.35	1	3.8
38	6/24/2010 10:18	PAINT	2.91	mg / cm ^2	Final	wall	brick	A	INTACT	TAN	208	rc	OUTSIDE	5.3	1	2.9
39	6/24/2010 10:18	PAINT	1.57	mg / cm ^2	Final	wall	brick	D	INTACT	TAN	208	rc	OUTSIDE	5.21	1	3.9
40	6/24/2010 10:19	PAINT	1.56	mg / cm ^2	Final	DOOR	METAL	D	INTACT	RED	208	rc	OUTSIDE	1	1	0
41	6/24/2010 10:19	PAINT	0.89	mg / cm ^2	Final	DOOR fr	METAL	D	INTACT	RED	208	rc	OUTSIDE	1.94	1	2.9
42	6/24/2010 10:21	PAINT	1.56	mg / cm ^2	Final	brick	brick	D	INTACT	White	208	rc	OUTSIDE	5.69	1	2.4
43	6/24/2010 10:23	PAINT	3.56	mg / cm ^2	Final	brick	brick	D	INTACT	White	208	rc	GARAGE	2.82	1	0.2
44	6/24/2010 10:24	PAINT	3.36	mg / cm ^2	Final	brick	brick	D	INTACT	White	208	rc	GARAGE	3.25	1	0.03
45	6/24/2010 10:26	PAINT	2.02	mg / cm ^2	Final	brick	brick	A	INTACT	White	208	rc	GARAGE	1.65	1	0.01
46	6/24/2010 10:30	PAINT	3.79	mg / cm ^2	Final	brick	brick	A	INTACT	White	208	rc	GARAGE	2.53	1	0.23
47	6/24/2010 10:31	PAINT	1.35	mg / cm ^2	Final	brick	brick	A	INTACT	White	208	rc	GARAGE	1.65	1	0.08
48	6/24/2010 10:31	PAINT	2.92	mg / cm ^2	Final	brick	brick	A	INTACT	White	208	rc	GARAGE	4.01	1	0.23
49	6/24/2010 10:32	PAINT	1.56	mg / cm ^2	Final	DOOR	METAL	B	INTACT	RED	208	rc	Kitchen	1	1	0
50	6/24/2010 10:32	PAINT	1.35	mg / cm ^2	Final	DOOR fr	METAL	B	INTACT	RED	208	rc	Kitchen	1	1	0
51	6/24/2010 10:33	PAINT	3.12	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	Kitchen	5.57	1	0.02
52	6/24/2010 10:33	PAINT	3.58	mg / cm ^2	Final	WALL	PLASTER	C	INTACT	WHITE	208	rc	Kitchen	7.36	1	0.18
53	6/24/2010 10:34	PAINT	3.8	mg / cm ^2	Final	FLOOR	tile	C	INTACT	RED	208	rc	Kitchen	1.54	1	0
54	6/24/2010 10:35	PAINT	3.59	mg / cm ^2	Final	WALL	PLASTER	C	INTACT	WHITE	208	rc	bullpn	2.73	1	0.01
55	6/24/2010 10:36	PAINT	3.35	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	bullpn	1.51	1	0.04
56	6/24/2010 10:37	PAINT	1.34	mg / cm ^2	Final	Door fr	METAL	A	INTACT	WHITE	208	rc	bullpn	5.76	1	0.3
57	6/24/2010 10:37	PAINT	3.36	mg / cm ^2	Final	DOOR	METAL	A	INTACT	WHITE	208	rc	bullpn	6.93	1	0.3
58	6/24/2010 10:38	PAINT	1.57	mg / cm ^2	Final	DOOR	METAL	A	INTACT	WHITE	208	rc	chiefs office	1	1	0
59	6/24/2010 10:39	PAINT	1.34	mg / cm ^2	Final	DOOR fr	METAL	A	INTACT	WHITE	208	rc	chiefs office	1	1	0
60	6/24/2010 10:40	PAINT	3.36	mg / cm ^2	Final	WALL	PLASTER	D	INTACT	WHITE	208	rc	chiefs office	1.79	1	0
61	6/24/2010 10:40	PAINT	0.67	mg / cm ^2	Final	window sill	Tile	D	INTACT	WHITE	208	rc	chiefs office	1.75	1	11.8
62	6/24/2010 10:40	PAINT	0.68	mg / cm ^2	Final	window sill	Tile	D	INTACT	WHITE	208	rc	chiefs office	2.42	1	10.4
63	6/24/2010 10:41	PAINT	0.67	mg / cm ^2	Final	window sill	Tile	B	INTACT	RED	208	rc	chiefs office	1.8	1	12
64	6/24/2010 10:42	PAINT	1.35	mg / cm ^2	Final	DOOR	WOOD	A	INTACT	WHITE	208	rc	chiefs office	2.11	1	0.13

XRF Assay Results

Reading	Time	Type	Duration	Units	Sequence	Component	Substrate	Side	Condition	Color	Site	Inspector	Room	Depth	Action	PbC
65	6/24/2010 10:42	PAINT	1.35	mg / cm ^2	Final	DOOR fr	WOOD	A	INTACT	WHITE	208	rc	chiefs office	1.86	1	0.09
66	6/24/2010 10:43	PAINT	1.34	mg / cm ^2	Final	CABINET	WOOD	A	INTACT	BLUE	208	rc	chiefs office	3.2	1	0.18
67	6/24/2010 10:45	PAINT	2.91	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	dorm	3.21	1	0.03
68	6/24/2010 10:45	PAINT	2.7	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	dorm	7.5	1	0.04
69	6/24/2010 10:45	PAINT	3.13	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	dorm	4.62	1	0.05
70	6/24/2010 10:46	PAINT	0.9	mg / cm ^2	Final	WINDOW	tile	A	INTACT	RED	208	rc	dorm	1.82	1	11.7
71	6/24/2010 10:47	PAINT	1.33	mg / cm ^2	Final	DOOR	METAL	A	INTACT	RED	208	rc	Mens RR	1	1	0
72	6/24/2010 10:48	PAINT	3.13	mg / cm ^2	Final	WALL	PLASTER	A	INTACT	WHITE	208	rc	Mens RR	1.13	1	0
73	6/24/2010 10:49	PAINT	0.89	mg / cm ^2	Final	Shower	tile	A	INTACT	TAN	208	rc	Womens RR	2.09	1	17.1
74	6/24/2010 10:50	PAINT	0.67	mg / cm ^2	Final	Shower	tile	A	INTACT	TAN	208	rc	Womens RR	2.01	1	17
75	6/24/2010 10:50	PAINT	0.9	mg / cm ^2	Final	Window Sill	tile	D	INTACT	RED	208	rc	Womens RR	1.88	1	14.3
76	6/24/2010 10:57	PAINT	4.04	mg / cm ^2	Final	calibration				RED	208	rc		1.21	1	1.1
77	6/24/2010 10:58	PAINT	20.34	mg / cm ^2	Final	calibration				RED	208	rc		1.13	1	1
78	6/24/2010 10:58	PAINT	2.69	mg / cm ^2	Final	calibration				RED	208	rc		1.12	1	0.9
79	6/24/2010 10:59	PAINT	20.33	mg / cm ^2	Final	calibration				RED	208	rc		1.09	1	1

CITY OF SAN DIEGO

MEMORANDUM

DATE: August 28, 2002

TO: Yousef Ibrahim, Associate Civil Engineer, Engineering and Capital Projects Department, Public Buildings and Parks Division

FROM: Jeff Jones, Asbestos & Lead Program Inspector, AJ
via Alan Johanns, Asbestos & Lead Program Manager, Environmental Services Department, Environmental Protection Division

SUBJECT: Fire Station #5 Lead and Asbestos Sample Results

Per your request, the Asbestos & Lead Management Program (ALMP) inspected Fire Station #5 for asbestos containing materials and non-intact lead containing paint. The following is a summary of the results.

Fire Station #5 Asbestos and Lead Sample Results

SAMPLE #	TYPE OF MATERIAL	LOCATION	CONDITION	ASBESTOS (%)	LEAD (mg/Kg)
5327-1A	wall plaster	bull pen	good	ND	-
5327-1B	wall plaster	battalion chief office	good	ND	-
5327-1C	wall plaster	dorm	good	ND	-
5327-2	black 9"x9" floor tile	bull pen	good	4%	-
5327-3	black floor tile mastic	bull pen	good	ND	-
5327-4	duct tape	roof ducts	good	ND	-
5327-5	duct mud	roof ducts	good	ND	-
5327-6	black mastic	roof ducts	good	6%	-
5327-7	black roof mastic	roof	good	5%	-
5327-8	silver paint	roof	good	ND	-
5050	1'x1' ceiling tile	bull pen	good	ND	-
7785	1'x1' ceiling tile	bull pen	good	ND	-
8138	1'x1' ceiling tile	bull pen	good	ND	-
2888-1	ceiling plaster	apparatus room	good	ND	-
2888-2	light gray speckled sheet vinyl	hallway, restroom	good	ND	-
2888-3	sheetrock	hallway by restroom	good	ND	-
2888-4	roof core	roof	good	ND	-

Painted surfaces that were found to be intact during a visual inspection do not require abatement prior to demolition, and therefore were not sampled. All paint inspected at this site was found to be intact.

Approximately 90 mercury containing fluorescent light bulbs and 45 PCB containing ballasts are present in this building. These must be removed prior to demolition.

The City's as-needed abatement contractor can perform all required abatement of asbestos materials, fluorescent light bulbs, and PCB ballasts. I will work with our abatement contractor to generate a quote for the removal.

This survey was nondestructive in nature and did not include materials concealed behind walls and hard ceilings. If suspect materials are found during the demolition process that are not mentioned in this report then work must stop until a determination of the material's asbestos status is made by ALMP.

Attached is language to be inserted into your specification that will identify to your general contractor what hazardous material the City will be abating prior to demolition.

Please contact me at 858-573-1277 with any questions regarding this report.

Jeff Jones
Asbestos & Lead Program Inspector

Attachment

memo2002\1183.

ENVIRONMENTAL SERVICES DEPARTMENT
ASBESTOS & LEAD MANAGEMENT PROGRAM
CUSTOMER SERVICE EVALUATION

Your comments regarding the service you have received from the Asbestos & Lead Management Program staff is important to us. Your feedback will assist us to maintain a quality of service which meets the City's needs. The time you take to complete this form is valuable to us and we do appreciate your appraisal of our services.

Please rate the service you received in the following areas:

	Unsatisfactory	Poor	Average	Good	Excellent
1. Timeliness of service	1	2	3	4	5
2. Courtesy of staff	1	2	3	4	5
3. Willingness of staff to go the extra step to satisfy your needs	1	2	3	4	5
4. Technical knowledge of staff	1	2	3	4	5
5. Projects completed within budget and time frame	1	2	3	4	5
6. Overall quality of service	1	2	3	4	5

What is one thing we could do to improve the service provided to you? _____

_____

_____

Please provide any additional comments. _____

_____

_____

Optional: If you would like us to contact you for follow-up service, to answer questions, or to discuss this survey, please print your name and phone number below.

NAME: _____ PHONE: _____

Please return to MS 1103-B or FAX to (858) 492-5089

THANK YOU FOR YOUR PARTICIPATION IN HELPING US PROVIDE THE BEST POSSIBLE QUALITY SERVICE (573-1262).

FY 2011

THE CITY OF SAN DIEGO

Historical Resources Board

September 28, 2012

City Of San Diego

Dear Owners:

Subject: Historical Resources Board Hearing of 9/27/2012

The City of San Diego Historical Resources Board held a noticed public hearing on 9/27/2012 to consider the historical site designation for the following property:

3902 NINTH AVENUE, SAN DIEGO, CA 92103
ASSESSOR PARCEL NUMBER: 444-690-16-00 AND 444-690-15-00

At the hearing the Board voted not to designate this property as a historical resource. In arriving at their decision, the Board considered the information submitted including the historical report prepared by the applicant, the staff report and recommendation, and all other materials submitted prior to and at the public hearing, including public testimony. Additionally, the members of the Board voting on the designation personally inspected the property prior to the hearing. **The action of the Board is final and is not subject to appeal.** If you have any questions, please feel free to call me at (619) 533-6301, or email me at santhony@sandiego.gov.

Sincerely,

S Anthony

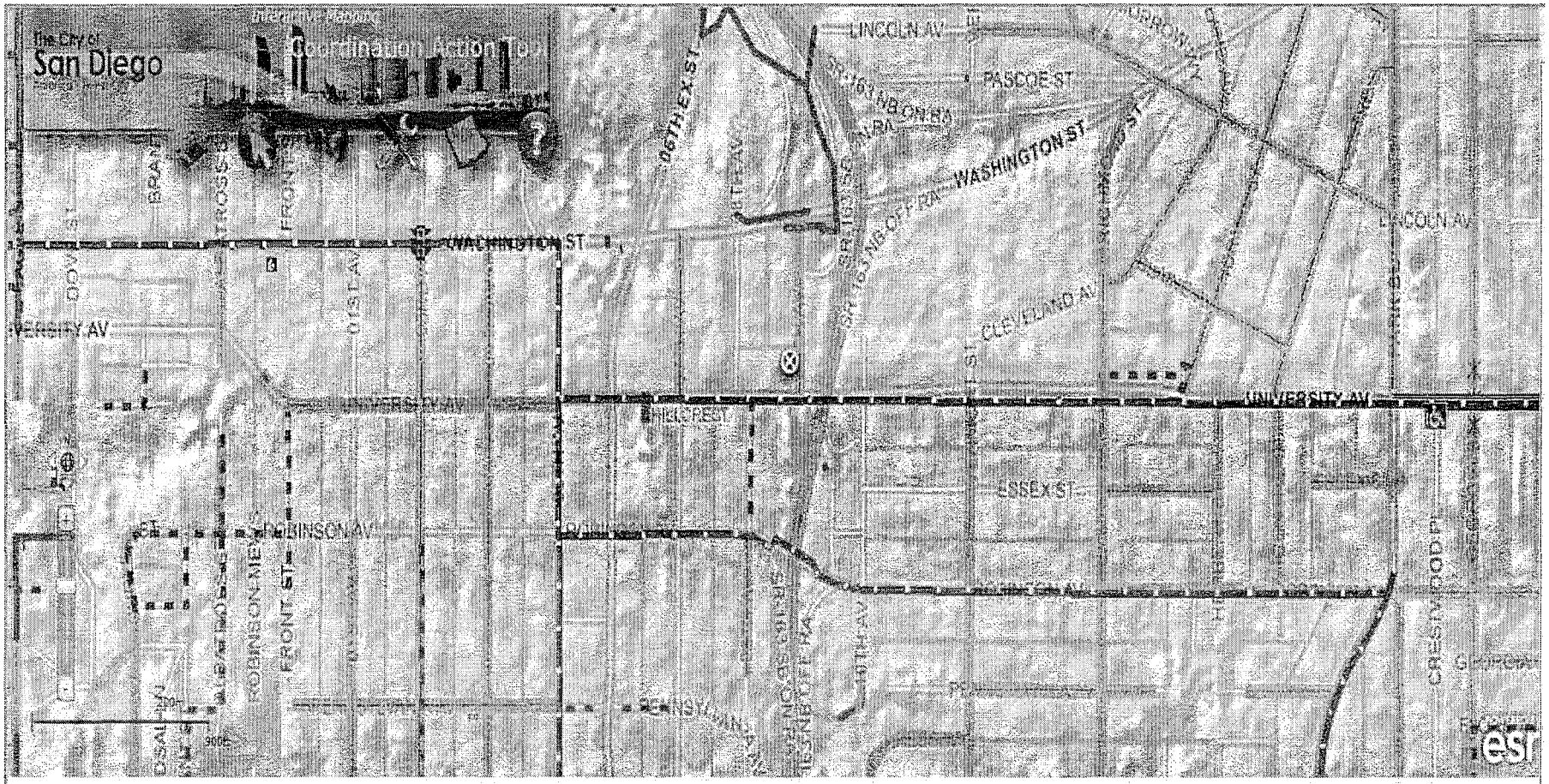
Shannon Anthony
Historical Resource Board Secretary

cc: Consultant
Council District
File

Development Services Department
1222 First Avenue, MS 512 • San Diego, CA 92101-4155
Tel (619) 235-5200 Fax (619) 446-5499

APPENDIX I

ADJACENT PROJECT CONFLICT WITH VICINITY OF FIRE STATION NO. 5



Update Selected | Update by SAP

Selected-ID	Selected Contact	Conflicting-ID	Conflict Contact	Title	Resolved	Comments	Resolved By	Date
S00788	Jadan, Rowaida	S11021	Bajoua, Mike	University Avenue Pipeline Replacement	☐			
S00687	Jadan, Rowaida	UU1	Mario Reyes	Briarwood Road	☐			
S00687	Jadan, Rowaida	UU446	Mario Reyes	Paradise Valley Road (Transmission)	☐			
S00687	Jadan, Rowaida	UU901	Mario Reyes	Residential Project Block 4AA	☐			
S00687	Jadan, Rowaida	813012	Huynh, Hung	Pipeline Rehabilitation U-1	☐			

APPENDIX J

NOTICE OF RIGHT TO APPEAL ENVIRONMENTAL DETERMINATION

THE CITY OF SAN DIEGO

Date of Notice: 2/12/13

NOTICE OF RIGHT TO APPEAL ENVIRONMENTAL DETERMINATION

DEVELOPMENT SERVICES DEPARTMENT
WBS# S-00688.02.06

PROJECT NAME/NUMBER: Fire Station 5/208885

COMMUNITY PLAN AREA: Uptown Community Plan

COUNCIL DISTRICT: 3

LOCATION: The project is located at 3902 Ninth Avenue in the Uptown Community Planning Area.

PROJECT DESCRIPTION: The project would demolish an existing 4,118 square-foot fire station and replace with a new two story 10,597 square-foot fire station with various site improvements on a .31 acre site. The station would house a crew of eight members and one battalion chief and accommodate one engine, one aerial truck and one battalion chief vehicle.

ENTITY CONSIDERING PROJECT APPROVAL: City of San Diego Development Services Department.

ENVIRONMENTAL DETERMINATION: CEQA Exemption 15302 (Replacement or Reconstruction)

ENTITY MAKING ENVIRONMENTAL DETERMINATION: Environmental Analysis Section, City of San Diego

STATEMENT SUPPORTING REASON FOR ENVIRONMENTAL DETERMINATION: Since the proposed fire station would be located on the same site as the existing fire station and would serve the same purpose and would not substantially expand capacity, the City of San Diego has determined the project meets the categorical exemption criteria set forth in the CEQA State Guidelines, Section 15302(c) [Replacement or Reconstruction]. The exemption allows for the replacement of existing structures and facilities where the new structure will be located on the same site as the structure replaced, and will have substantially the same purpose and capacity as the structure replaced and where the exceptions listed in Section 15300.2 would not apply.

DEVELOPMENT PROJECT MANAGER:	Angela Nazareno
MAILING ADDRESS:	1222 First Avenue, MS 301 San Diego, CA 92101
PHONE NUMBER:	619-446-5277

On 2/12/2013 the City of San Diego made the above-referenced environmental determination pursuant to the California Environmental Quality Act (CEQA). This determination is appealable to the City Council. If you have any questions about this determination, contact the City Development Project Manager listed above.

Applications to appeal CEQA determination made by staff (including the City Manager) to the City Council must be filed in the office of the City Clerk within 10 business days from the date of the posting of this Notice OR 15 business days from the date of the environmental determination, whichever occurs earlier. Applications to appeal CEQA determinations made by the Planning Commission from a Process Two or Three Appeal under SDMC section 112.0506 must be filed in the Office of the City Clerk within 10 business days from the date of the Planning Commission's decision. The appeal application can be obtained from the City Clerk, 202 'C' Street, Second Floor, San Diego, CA 92101.

This information will be made available in alternative formats upon request.

THE CITY OF SAN DIEGO

Date of Notice: February 3, 2016

NOTICE OF RIGHT TO APPEAL ENVIRONMENTAL DETERMINATION

DEVELOPMENT SERVICES DEPARTMENT
WBS No. S-00688.02.06

PROJECT NAME/NUMBER: Fire Station No. 5 Temporary Sprung Structure

COMMUNITY PLAN AREA: Uptown

COUNCIL DISTRICT: 3

LOCATION: 4311 Third Ave, San Diego, CA 92103

PROJECT DESCRIPTION: DESCRIPTION OF NATURE, PURPOSE, AND BENEFICIARIES OF PROJECT: Installation of a 40' x 60' sprung structure that will temporarily house Fire Department vehicles, including a fire engine/truck. The 2,400 SF sprung structure will be installed in an existing asphalt parking lot located on the property of 4311 Third Ave. The sprung structure has an architectural membrane consisting of a tensioned fabric and is supported with structural members. The sprung structure will be anchored by earth anchor with an ¾ inch diameter by five feet long at each of the 14 columns. The sprung structure is intended for temporary use until a permanent facility is identified and operational. The asphalt parking lot in which it will be installed will be restored back to its existing condition through patch work. Under a separate transaction, the Fire Department will be leasing an adjacent building to house firefighters which, in combination with the sprung structure, would function as a temporary Fire Station No. 5. The project is within the Uptown Community Planning Area in City Council District 3.

ENTITY CONSIDERING PROJECT APPROVAL: City of San Diego

ENVIRONMENTAL DETERMINATION: Categorically exempt from CEQA pursuant to CEQA State Guidelines Sections 15303 (New Construction or Conversion of Small Structures) and 15304 (Minor Alterations to Land).

ENTITY MAKING ENVIRONMENTAL DETERMINATION: City of San Diego Development Services Department

STATEMENT SUPPORTING REASON FOR ENVIRONMENTAL DETERMINATION: 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 15303 (New construction or conversion of small structures), which allows the construction of accessory structures, including

garages, carports, etc.; and Section 15304 (Minor alterations to land), which allows for the minor temporary use of land having negligible or no effects on the environment, and where the exceptions listed in Section 15300.2 would not apply.

CITY PROJECT MANAGER:	Rowaida Jadan, Project Manager
MAILING ADDRESS:	525 B Street, Suite 750, San Diego, CA 92101 San Diego, CA 92101
PHONE NUMBER:	(619) 533-6655

On February 3, 2016, the City of San Diego made the above-referenced environmental determination pursuant to the California Environmental Quality Act (CEQA). This determination is appealable to the City Council. If you have any questions about this project, contact the City Project Manager listed above.

Applications to appeal CEQA determination made by staff to the City Council must be filed in the office of the City Clerk within 10 business days from the date of the posting of this Notice (February 18, 2016). The appeal application can be obtained from the City Clerk, 202 'C' Street, Second Floor, San Diego, CA 92101.

This information will be made available in alternative formats upon request.

APPENDIX K

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

February 1, 2016

FIRE STATION NO. 5

CITY OF SAN DIEGO
San Diego, California

buildingSMARTalliance

Please consider the environment before printing this document

Rob Wellington Quigley, FAIA
416 Thirteenth Street San Diego, California 92101 Telephone: 619-232-0888

USER GUIDE FOR THE PROJECT MANUAL 00 01 08

1. SUMMARY:

A. GENERAL: This Guide is provided as a basis for understanding the organization and use of this Project Manual.

B. DEFINITIONS:

1. Construction Documents: Defined as the written and graphic documents prepared or assembled by the City Representative for communicating the design of the project and administering the contract for its construction. These include the Procurement Requirements (Advertisement for Bids, Instructions to Bidders, and Bid Forms) and the Contract Documents.
2. Contract Documents: Defined as the legally enforceable requirements that become part of the contract when the agreement is signed, these include the Contract Forms, Conditions of the Contract, Specifications, Drawings, Addenda, and Contract Modifications. They describe the proposed construction (referred to as the "Work") that results from performing services, furnishing labor, and supplying and incorporating materials and equipment into the construction.
3. Contract Forms: Include the agreement, bonds and certificates.
4. Conditions of the Contract: Define the basic rights, responsibilities, and relationships of the parties involved in the construction process.
5. Specifications: Divided into 50 Divisions, the Specifications define the qualitative requirements for products, materials, and systems and the standards of workmanship required for installation. Division 01 sections constitute the GENERAL REQUIREMENTS necessary for the Project; Divisions 02 through 49 comprise the Technical Specifications portion of the Project Manual.
6. Drawings: Graphic representations of the Work, which show the materials and their relationships to one another, including sizes, shapes, fit, location, and connections.
7. Addenda: Written or graphic documents issued to clarify, revise, add to, or delete information in the original bidding documents or in previous addenda.
8. Contract Modifications: Written instruments used to add to, delete from or otherwise modify the Work after the construction agreement has been signed.

C. DIVISION 01 - GENERAL REQUIREMENTS: Division 01 of the Specifications expands on certain of the broad provisions of the Conditions of the Contract and governs the execution of all Technical Sections of the Specifications. Sections included in Division 01 specify the administrative and procedural requirements, as well as temporary facilities, required for the Project. All requirements stated in Division 01 apply to and will be in force for all subsequent Sections included in Divisions 02 through 49.

D. PRODUCT REFERENCES: Specification Section numbers and titles follow the latest recommendations of MasterFormat™ 2014 Edition published by the Construction Specifications Institute (CSI). The Section titles represent work results and may be stated in the singular or plural without regard to the actual quantity used on the project. The organization of specifications by Section is not meant to define subcontracts or other divisions of work by trades.

E. MANUAL FORMAT:

1. General: The first page of each Section is graphically defined with very large and boldfaced Section number and title. Succeeding pages of each Section are printed back-to-back, with header in normal-sized type that has the Section name and number and page number appearing in the upper right-hand corner of the page.
2. Underlined and Boldface Type: Underlining and bolding have been used in different combinations throughout the Project Manual to highlight headings and significant text. These devices have been used to assist the user in finding items of information or to emphasize the importance of certain information. No other meaning is attached to the use of boldface and underlined text.
3. Dates: The official date of issue of the Project Manual appears on the cover sheet of this Project Manual. Dates subsequent to that date on individual Section pages indicate reissue of entire Sections for clarification.

1.2 DEFINITIONS AND INTERPRETATIONS:

A. WORDS AND TERMS: Those which are frequently used, with special meanings, in this Project Manual are defined in Section 01 42 00 - REFERENCES.

B. GOVERNING DICTIONARY: The definitions of words used in these Specifications, which are not defined in Section 01 42 00 - REFERENCES, the General Conditions, or in referenced standards, are as given in "The American Heritage Dictionary of the English Language".

C. SPECIFICATION LANGUAGE: These Specifications are written in the imperative mood, as defined in the Construction Specifications Institute's Project Delivery Practice Guide. Imperative language is directed to the Contractor. The indicative mood is employed on occasion when such sentence structure is necessary to convey the intended meaning in a more accurate or understandable form. The text is streamlined, with the colon (:) employed as a symbol for the words "shall be", "shall have", "shall conform with", "shall comply with", or "shall meet the requirements of". The colon is also used to separate a paragraph title or heading from the text that follows.

* * *

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Division 01 - GENERAL REQUIREMENTS

SUMMARY OF WORK Section 01 01 50

1. GENERAL:

A. THE PROJECT: The name of the Project is Fire Station No. 5. The project site is located at 3902 Ninth Avenue, San Diego, CA 92103.

B. RESPONSIBLE PARTIES: Construction of this Project is governed by the agreement between the City and the Contractor. Statements in the specifications are directed to this contractor, who has overall responsibility for the subcontractors.

C. COMMUNICATIONS: Written or graphic communications during construction shall be documented using the PDF technology of Adobe Acrobat Standard 6.0 or greater.

D. WORK COVERED BY THE CONTRACT DOCUMENTS:

1. General: Under a single contract construct new 10,597-square foot, two-story fire station in conformance with Drawings and Specifications prepared by Rob Wellington Quigley, FAIA, Architects, San Diego, CA, and bound herewith.
2. Scope of Work: Work includes demolition of the existing Fire Station, located at 3902 Ninth Ave, and construction of a new station on the site; construction of a temporary fire station, located at 4311 3rd Avenue, San Diego to relocate fire crew until the construction of the new station is complete; and repaving of the alley adjacent to the station to accommodate the fire trucks' loads. Work also includes returning the temporary fire station site to its original condition upon completion, replacing the trellis and repaving the parking lot, and moving the dismantled temporary structure to a location as directed by the City Representative.

E. REQUIREMENTS:

1. Requirements for Sequencing or Scheduling:
   a. General: Begin work as identified in the Construction Contract, proceed as shown in the Progress Schedule as required under Section 01 32 14 - Progress Schedule, and complete work within the limits designated in the Construction Contract. Refer to General Provisions.
   b. Schedule of Work: Coordinate work to accommodate the City's operations and use of premises during construction period; coordinate construction schedule and operations with City's Representative; indicate all special requirements in the Progress Schedule as specified.
2. Owner-Furnished, Contractor-Installed Items: Existing equipment will be provided for installation, including work bench and lockers.

2. PRODUCTS:

A. HAZARDOUS MATERIALS:

1. General: No asbestos or products containing asbestos have been knowingly specified for this Project.
2. Notification: If materials containing asbestos are brought to the site for use or installation in the Work; or if such materials are encountered in existing work upon which new work is being performed, notify the City immediately so that appropriate action may be taken.
3. Certification: A statement certifying that no new materials containing asbestos have been included in the Work is required at the completion of the Project.

3. EXECUTION:

A. CONTRACTOR'S USE OF PREMISES:

1. General: Confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents; do not unreasonably encumber the site with materials or equipment.
2. Access to Site: Roads for access to and from building site, loading areas and parking space shall be as indicated. Confine traffic and materials delivery to these roads and locations.
3. Storage: Contractor is responsible for protection and safekeeping of products stored on the site. Specific areas for storage of materials and site fabrication shall be as indicated by the City.

B. PROTECTION: Erect temporary barricades, warning signs and substantial handrails to protect persons in and around the work areas and observe safety precautions. Conform to applicable OSHA rules and regulations and State Safety Regulations and Orders.

* * *

MEASUREMENT AND PAYMENT Section 01 02 50

1. GENERAL:

A. DESCRIPTION:

1. This section defines the Lump Sum Prices and Allowances listed in the Bid Schedule, and the manner in which they will be used to determine measurement and payment for all items included in the Bid Schedule. Parts 2 and 3 of this section describe the procedures required to be followed for monthly progress payments to the CONTRACTOR.
2. Payment for all items of the Bid Schedule whether lump sum or unit price shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of WORK being described, as necessary to complete the various items of the WORK all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs shall be included in the prices named in the Bid Schedule for the various items of WORK.
3. Monthly pay requests are due on the 6th of each month, and while pay requests will be accepted prior to this date, pay request processing will not begin until this date for purposes of meeting the City's pay request processing obligations under the California Public Contract Code. Failure of the CONTRACTOR to submit his pay request by this day may be cause for the rejection of the pay request. If rejected, the CONTRACTOR may have to resubmit his pay request the next month. Should the submittal date fall on a holiday or weekend day during the month then the CONTRACTOR shall consider the next working day as the due date.

B. BID PROPOSAL:

1. Lump Sum Prices: The CONTRACTOR shall provide Lump Sum Prices in the Bid Schedule for all WORK in the Contract Documents, except items of WORK listed in the Contract as Unit Priced Items. For Lump Sum items, only the total amount need be filled in.
2. Allowance Items: Allowance Item amounts are provided by the CITY to cover the cost of additive WORK not presently identified in the Contract Documents. Payment for Allowance Items will be made only when authorized as described in Part 1.C, below.
3. Retention: Payment for all bid items is subject to the retention provisions of the General Conditions.
4. Schedule: All scoped Allowance Bid Items and Unit Priced Bid Items are included in the scope of the Contract without specific locations for the WORK provided. The CITY reserves the right to direct that these scoped items of WORK be performed when they are encountered, and the CONTRACTOR is obligated to accommodate this WORK within the original contract duration. The CONTRACTOR will not be entitled to additional time regardless of where the WORK is encountered.
5. Quantities for each item in the Bid Schedule will be used to analyze the bids and determine contract award.
6. Specified Items and Stipulated Prices: The stipulated price for these items cannot be invoiced until the item is complete and accepted by the CITY REPRESENTATIVE.

C. MEASUREMENT AND PAYMENT:

1. General: This article defines the manner and method to develop the Lump Sum and Allowance bid amounts of all items identified in the Bid Schedule. Bid amounts will include all plant, equipment, tools materials, labor, service, and all other items required to complete the WORK included in the Contract unless specifically excluded by this section. WORK required for which no separate bid item is identified will be considered as a subsidiary obligation of the CONTRACTOR, and the cost therefore shall be included in the most applicable bid item. Compensation for completion of the WORK will be determined by use of the cost loaded CPM schedule. Bid amounts for each item will be the basis for development of budget values for activities included in the cost loaded CPM schedule as described in the Contract Documents. Allowance Bid Item amounts will also be adjusted by a Change Order to the contract amount when WORK is completed, and actual authorized quantities and Allowance amounts are established.

2. Contract-Required WORK:
   a. Bid Item No. 1 - Construction of Fire Station No. 5 and related site improvements. (Lump Sum): The lump sum payment for the demolition of the existing Fire Station at 3902 Ninth Avenue, San Diego, California 92103, and Construction of the new Fire Station No. 5 and related site improvements shall be considered full compensation for furnishing, constructing and completion of all facilities, demobilization, insurance, supervision, planning, design, and engineering fees, complete as defined within these Contract Documents.
   b. Bid Item No. 2 - Construction of Temporary Fire Station No. 5 and related site improvements. (Lump Sum):
      1. Description: The Construction of Temporary Fire Station No. 5 at 4311 3rd Avenue, San Diego California 92103, and related site improvements including furnishing, constructing and completion of all facilities, demobilization, insurance, supervision, planning, design, and engineering fees, complete as defined in Section 13 34 23 - TEMPORARY FIRE STATION, within these Contract Documents.
      2. (Lump Sum):
   c. Bid Item No. 3 –Building Permits (Allowance):
      1. General: Refer to City Supplement section 7-5, "Permit, Fees, and Notices."
      2. Description: Building Permits for the Permanent and Temporary Fire Stations, including mechanical, plumbing and electrical, fees related to the Fuel Tank Permit, and including the City of San Diego Water and Sewer Capacities and Connection Fees. Payment for the Building Permit Allowance will be based on the actual expenditures and for pre-authorized items of the Work in accordance with the Contract Documents. The unused portions of the allowance will revert to the City upon Acceptance.
         No measurement will be made for this item. Payment for Work under this bid item will be made only to the extent that such Work is specifically authorized in advance by the CITY REPRESENTATIVE.
      3. Allowance Amount: $100,000.00.
   d. Bid Item No. 4 - Photovoltaic Panels at Roof Installation - (Allowance):
      1. Description: Furnish, install, connect, test and make operational the photovoltaic panels at roof installation as shown and as specified in Section 26 31 01 - PHOTOVOLTAIC SYSTEM.
      2. Allowance Amount: $100,000.00.
   e. Bid Item No. 5 – SDG&E Service Fee, Dry Utilities Connections (Allowance):
      1. General: Payment for the SDG&E Service Fee, dry utilities connections, Pacific Bell, A.T.&T. and Time Warner Allowance will be based on the actual expenditures and for pre-authorized items of the Work in accordance with the Contract Documents. The unused portions of the allowance will revert to the City upon Acceptance.
         No measurement will be made for this item. Payment for Work under this bid item will be made only to the extent that such Work is specifically authorized in advance by the Engineer.
      2. Allowance Amount: $59,101.00.
   f. Bid Item No. 6 - Water Pollution Control Program Development (Lump Sum): Refer to City Supplement section 701-13.9.5.
   g. Bid Item No. 7 - Water Pollution Control Program Implementation (Lump Sum): Refer to City Supplement section 701-13.9.5.
   h. Bid Item No. 8 – Furniture, Fixtures and Equipment (Allowance):
      1. General: No measurement will be made for this item. Payment for WORK under this bid item will be made only to the extent that such WORK is specifically authorized in advance by the Engineer.
         Prices for this WORK will be negotiated. This item is considered incidental to the Contract and may be adjusted or deleted in its entirety.
      2. Allowance Amount: $120,000.00.
   i. Bid Item No. 9 – Bonds (Lump Sum):
      1. General: Refer to the GREENBOOK and City Supplement section 2-4, "Contract Bonds."
      2. Description: The Bid item for bonds includes full compensation for actual costs of payment and performance bonds. You may submit a request for payment of actual invoiced costs up to the bid amount, but not to exceed 2.5% of the Contract Price, not less than 10 Working Days after Award of Contract.
         If the Bid item for bonds exceeds actual invoiced costs, any such differential amount up to the bid amount, must be paid as a part of the Final Payment.
      3. (Lump Sum):
   j. Bid Item No. 10 – Field Orders - (Allowance):
      1. General: Refer to City Supplement section 9-3.5.

2. No measurement will be made for this item. Payment for WORK under this bid item will be made only to the extent that such WORK is specifically authorized in advance by the Engineer.
   Determining the price for miscellaneous field orders will be done in accordance with the Contract Document provisions.
3. Allowance Amount: $335,000.00.

2. PRODUCTS:

A. GENERAL PROGRESS PAYMENT REQUIREMENTS:
   1. Payment for WORK performed shall be in accordance with the Cost Loaded CPM. The CITY REPRESENTATIVE will verify measurements and quantities. Each activity necessary to manage and complete the WORK is identified on the contract schedules. Each activity will be assigned its respective value, a portion of the contract price, as shown on the Summary of Values.
   2. Payment for all lump sum costs and services incurred on this Contract shall be based on the earned value of WORK accomplished during the reporting period. Earned value is determined by the completion percentage of each activity applied to the total value of the activity. No construction activity shall be deemed 100% complete until the CONTRACTOR has completed the physical check out and inspection of the completed WORK and has submitted the signed inspection form to the CITY REPRESENTATIVE.
   3. Unit price items will be paid based on quantities (or equivalent quantities) installed.
   4. Earned value is derived from the current status of the CONTRACTOR Construction Schedule as determined by the monthly schedule status submittals. Each schedule status submittal is reviewed and approved by the CITY REPRESENTATIVE prior to the CONTRACTOR obtaining approval for the Summary of Earned Values or quantities installed and the Application for Payment.
   5. The CONTRACTOR shall not take advantage of any apparent error or omission on the Drawings or Specifications, and the CITY REPRESENTATIVE shall be permitted to make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents at no additional cost to the CITY.
   6. The retainage specified in the contract shall apply to all payments to the CONTRACTOR including permits and mobilization.

B. APPLICATION FOR PAYMENT:
   1. Application for payment shall be on the CITY's form provided by the CITY REPRESENTATIVE and certified by signature of an Authorized Officer of the CONTRACTOR. Three (3) copies of the application for payment shall be submitted. Application shall be made monthly.
   2. The Application for Payment contains all necessary references and attachments that substantiate the invoice for progress payment, (e.g., certified payrolls, labor reports, progress schedule data, and Summary of Earned Values). It must be preceded or accompanied by schedule and status data in accordance with the Contract Document provisions.
   3. The Application for Payment is submitted according to the format and instructions provided by the CITY and covering the WORK completed through the last day of the previous month or through the date established by the CITY REPRESENTATIVE.

3. EXECUTION:

A. MONTHLY REVIEWS/APPLICATION FOR PAYMENT:
   1. Monthly review meetings between the CONTRACTOR and the CITY REPRESENTATIVE will be held within 7 days prior to the payment application date designated by the CITY REPRESENTATIVE. Prior to the monthly review meeting, the CONTRACTOR will submit the Master Record Documents as identified in the Contract Document provisions, an updated schedule and a signed application for payment showing a Summary of Earned Values for the reporting and payment period so that the CITY REPRESENTATIVE can compare earned values to available status data. The CONTRACTOR shall make any adjustments to the Master Record Documents, updated schedule, and payment applications deemed necessary. Upon completion of the adjustments the CITY REPRESENTATIVE will sign the payment request and forward it to the CITY. The CITY REPRESENTATIVE will determine payment amounts if agreement with the CONTRACTOR is not reached.

B. PAYMENT FOR PRODUCTS STORED ON SITE:
   1. Refer to City Supplement section 9-3.3.1.1.
   2. The CONTRACTOR may request payment for products (material and/or equipment) which will be incorporated into the WORK and which are delivered and stored on-site. Payments for products stored at the site shall be based upon the cost of all acceptable materials and equipment not incorporated in the WORK but delivered and suitably stored at the site; provided each such individual item has a value of more than $5000 and will become a

permanent part of the WORK. The Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that the CONTRACTOR has received the materials and equipment free and clear of all liens, charges, secured interests, and encumbrances and evidence that the materials and equipment are covered by appropriate property insurance as specified in the insurance provisions and other arrangements to protect the CITY'S interest.

C. PARTIAL PAYMENTS FOR MATERIALS STORED OFF SITE:
   1. Refer to City Supplement section 9-3.3.1.2.
   2. The CONTRACTOR may request partial payment for Products (material and/or equipment), which will be incorporated into the WORK and which are delivered and stored off-site. Any payments approved pursuant to this sub-section shall not exceed sixty-five percent (65%) of the Product's invoiced value and shall be subject to retainage as set forth in the General Conditions. The CITY reserves the right to refuse approval for payment for any Equipment or Materials suitably stored off-site in its sole discretion, regardless of whether all conditions contained herein have been met.
   3. Partial payment may be made for Products eligible for off-site delivery and storage only upon presentation by the CONTRACTOR of a Bill of Sale, an Invoice or an Affidavit certifying that the material is received by the CONTRACTOR free and clear of all liens, encumbrances and secured interests of any kind, and including, for off-site delivery, evidence acceptable to the CITY that "all-risks" property insurance in an amount sufficient to protect the interests of the CITY is in effect at the approved site, and that the CITY is a loss payee and an additional insured.
   4. Partial payment for Products delivered and stored off-site shall be contingent upon CONTRACTOR'S compliance with the storage and protective maintenance requirements set forth in the Contract Document provisions and all other requirements necessary to preserve equipment warranties for the benefit of the CITY.
   5. All costs associated with delivery to and storage at an off-site facility shall be assumed by the CONTRACTOR notwithstanding the CONTRACTOR'S request for and the obtaining from the CITY approval to so deliver and store the materials.
   6. CONTRACTOR shall provide written evidence to the CITY of having made arrangements for unrestricted access by the CITY and its authorized representatives to the materials wherever stored, including provision for the CITY to take control and possession of such materials at any time and without restriction.
   7. CONTRACTOR must provide the CITY, upon request and prior to any partial payment, documentation which transfers absolute legal title to such materials to the CITY conditional only upon receipt of final payment. Neither such transfer of title nor any partial payment shall constitute acceptance by the CITY of the materials, nor void the right to reject materials subsequently found to be unsatisfactory, or in any way relieve the CONTRACTOR of any obligation arising under the Contract Documents.

* * *

SUBSTITUTION PROCEDURES Section 01 25 00

1. GENERAL:

A. SUMMARY: This Section includes administrative and procedural requirements for handling requests for substitutions. Refer also to General Provisions.
   1. Definitions:
      a. General: Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.
      b. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents that are proposed by the Contractor after award of the Contract are considered to be requests for substitutions.

B. PRODUCT OPTIONS: Refer to Section 01 60 00 - PRODUCT REQUIREMENTS.

C. SUBMITTALS:
   1. Products List: Include products for which Contractor proposes a substitution in the Products List submitted under Section 01 60 00 - PRODUCT REQUIREMENTS.
   2. Substitutions:
      a. General: For any request for "approved equal" or substitution, submit one (1) electronic copy (PDF) of completed and signed Substitution Request with required substantiating data.
      b. Substantiating Data:
         1. Required Information: Provide product identification; manufacturer's name and address; manufacturer's literature including product description, performance and test data and all reference standards; samples; and name and address of similar projects using the product, including dates of installation and names of Architect and Owner.
         2. Data Comparison: Submit a side-by-side, item-by-item comparison of all characteristics of the specified product and the proposed product.
         3. Construction Schedule: Provide statement of effect of substitution on construction schedule.
         4. Cost Comparison: Submit cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
   3. City's Action: If necessary, the City will request additional information or documentation for evaluation within one (1) week of receipt of a request for substitution. The City will notify the Contractor of acceptance or rejection of the substitution in accordance with the General Provisions.
   4. Distribution: Accepted substitution requests will be distributed as electronic copy (PDF) to the Architect, City, and Contractor.

D. COORDINATION: City's acceptance of product as "equal" or as a substitution does not relieve Contractor from responsibility for compliance with requirements of any portion of Contract Documents; Contractor shall be responsible, at Contractor's own expense, for any changes in other parts of the Work which may be caused by such substitution.

2. PRODUCTS:

NOT USED

3. EXECUTION:

NOT USED

* * *

CONTRACT MODIFICATION PROCEDURES Section 01 26 00

1. GENERAL:

A. DESCRIPTION: Requirements for documentation of changes in the Work, as defined in the General Provisions.

B. CHANGE PROCEDURES:

1. Authorized Agent: Submit to City the name of the individual authorized to receive change documents and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
2. Proposal Request: City may issue a Proposal Request which includes a detailed description of a proposed change in the Work. Contractor will prepare and submit an estimate within ten (10) days.
3. Request for Change: Contractor may propose a change by submitting a written request to the City, describing the proposed change and its full effect on the Work; include a statement describing the reason for the change, the effect on the Contract Sum/Price and Contract Time with full documentation, and a statement describing the effect on work by separate or other contractors. Document any requested substitutions in accordance with Section 01 25 00 - SUBSTITUTION PROCEDURES.
4. Distribution of Completed Documents: Completed Change Orders and Construction Change Directives will be in PDF form.

C. CHANGE ORDERS:

1. Format: Issued by City to order changes to the work which involve a change in Contract Price and/or Contract Time.
2. Documentation of Change in Contract Price And/or Contract Time:
   a. General: Maintain detailed records of work done on a time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.
   b. Quotation Breakdown: Itemize each quotation for a change in cost or time in sufficient detail to allow evaluation of the quotation. As a minimum, itemize separately each significant material and equipment purchase and the work of each trade and subcontractor.
   c. Supporting Data:
      1. Costs: Separate costs for products, labor, equipment, and subcontractor quotations.
      2. Quantities: Products, labor, and equipment.
      3. Taxes, Insurance and Bonds: As required.
      4. Overhead and Profit: As required.
      5. Justification: Change in Contract Time.
      6. Credit: For deletions from Contract, similarly documented.
      7. Additional Data: On request, as required to support computations.
   d. Claim for Additional Costs:
      1. General: Support each claim for additional costs, and for work done on a time and material basis, with the following additional information:
      2. Origin and Date of Claim: State name and originator and date.
      3. Dates and Times: When work was performed and by whom.
      4. Time Records and Wage Rates: As recorded and paid.
      5. Invoices and Receipts: For products, equipment, and subcontracts, similarly documented.
3. Execution of Change Orders: City will issue Change Orders for signatures of parties as provided in the General Provisions.

D. CONSTRUCTION CHANGE DIRECTIVE: Issued to instruct the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. The document will describe changes in the Work, and will designate method of determining any change in Contract Price or Contract Time. Promptly execute the change in Work.

2. PRODUCTS:

A. TYPES OF CHANGE ORDERS:

1. Stipulated Price Change Order: Based on Proposal Request and Contractor's maximum price quotation or Contractor's request for a Change Order approved by City.
2. Unit Price Change Order:
   a. General: For unit costs or quantities of units of work which are not pre-determined, execute Work under a Construction Change Directive.
   b. Pre-determined Unit Prices and Quantities: Change Order will be executed on a fixed unit price basis.
   c. Changes in Contract Price or Contract Time: Computed as specified for Time and

Material Change Order.

3. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. City will determine the change allowable in Contract Price and/or Contract Time as provided in the Contract Documents. Maintain detailed records of work done on time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

3. EXECUTION:

A. CORRELATION OF CONTRACTOR SUBMITTALS:

1. General: Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum/Price.
2. Progress Schedule: Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust time for other items of work affected by the change, and resubmit.
3. Record Documents: Record authorized changes in Project Record Documents.

* * *

INFORMATION REQUEST PROCEDURE Section 01 26 31

1. GENERAL:

A. DESCRIPTION: Submit request for information, interpretation and/or clarification to the City promptly upon identification of need, and in reasonable time so as not to affect the progress of the Work.

B. SUBMISSION PROCEDURES:

1. General: Request for information beyond that set forth in the Contract Documents will be considered only when the request is in writing and fully documented.
2. Time: Identify and submit requests for information in a timely manner.
3. Pre-submission Review: Before submitting request to the City, Contractor shall conduct a review to determine that the information requested, including items submitted by subcontractors or suppliers, is not shown in the Contract Documents.
4. Category of Request:
   a. General: Submit requests for information when one or more of the following conditions occur:
   b. Need for Clarification: When information shown or indicated in the Contract Documents is unclear in its intent.
   c. Unforeseen Condition: Discovery of unforeseen condition or circumstance that is not shown or indicated in the Contract Documents.
   d. Conflict Within Documents: Discovery of an apparent inconsistency, conflict or discrepancy between different portions of the Contract Documents, where the intent cannot be reasonably inferred from information shown or indicated.
   e. Omission: Discovery of what appears to be an omission in the Contract Documents, where the intent cannot be reasonably inferred from information shown or indicated.
   f. Coordination Problem: Discovery of unforeseen condition in coordinating placement of work that is specifically related to the Contract Documents.
5. Unacceptable Requests:
   a. General: Do not submit requests for information for confirmation of any action already taken by the Contractor. Requests will not be accepted that imply confirmation of any unauthorized change to the Work.
   b. Untimely Submission: A request for information that is submitted in a belated manner without proper coordination and scheduling of the Work of related subcontractors will not be reviewed and will be returned to the Contractor.
   c. Submittal: A request for information that is included as part of a submittal will not be processed; see Section 01 33 10 - SUBMITTALS.
   d. Substitution: A request for information that is a request for substitution will not be processed; see Section 01 25 00 - SUBSTITUTION PROCEDURES.
   e. Exclusionary Submission: A request that implies that specific portions of the work are assumed to be excluded or considering a separate portion of the Contract Documents in part rather than as a whole will not be processed.
6. Log: Contractor shall prepare and maintain the official log of requests for information. Review status of log at each job progress meeting.

2. PRODUCTS:

A. SUBMISSION REQUIREMENTS:

1. Request for Information (RFI) Form:
   a. General: Provide a completed and legible PDF of the RFI Form with each submittal.
   b. RFI Number: Identify RFIs sequentially starting from number one (1); number re-submissions with same number as original and add letter designation A., B., C., etc., in order submitted, until resolution is achieved.
   c. Contractor: Provide company name and mailing address with signature of contact person responsible for work on this Project, certifying to review of RFI.
   d. Subcontractor and/or Supplier: Provide company name, mailing address, telephone number and name and email of contact person responsible for work on this Project.
   e. RFI Description:
      1. General: Describe subject of RFI completely.
      2. Specifications References: Identify specification section number and paragraph number under consideration.
      3. Drawing References: Identify specific drawing number and/or detail number under consideration.
      4. Attachments: Identify as required, to support description.
   f. Contractor's Proposed Resolution:
      1. General: Describe suggested resolution; support with attachments as required.

2. Cost Impact: Indicate impact on costs; explain Contractor's original basis for bid and, based on the current request, reason that additional costs should be considered.
3. Time Impact: Indicate effect on schedule; explain Contractor's original basis for bid and, based on the current request, why a time extension should be considered.

3. EXECUTION:

A. CITY'S RESPONSE:
   1. General: City will respond on the RFI Form in accordance with the General Provisions and include attachments, as referenced. Verbal responses to such requests are to be considered informational; official written response will only be given on annotated PDF of original RFI Form.

B. DISTRIBUTION:
   1. General: Submit PDF of original, signed copy. PDF with the official response will be returned to the Contractor.
   2. Consultants: The City will distribute copies of requests for information to project consultants, as required for their participation. Direct communication and response between project consultants and Contractor will be considered informational only.
   3. Response: The Contractor will make and distribute copies of the official response to subcontractors and suppliers, as required.

* * *

PROJECT MANAGEMENT & COORDINATION Section 01 31 00

1. GENERAL:

A. SUMMARY: Coordinate scheduling, submittals, and Work of the various sections of these Specifications to assure the efficient and orderly sequence of installation of each part of the Work. Coordinate construction operations included under different sections that depend on each other for proper installation, connection, and operation.

B. SUBMITTALS:
   1. General: Within seven (7) calendar days of receipt of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the superintendent and other key personnel in attendance at the Project Site. Identify each individual by name, title, and provide a description of their duties and responsibilities. Update list within seven (7) calendar days of any staff change.
   2. Communications: Submit written procedures for Project communications including submittals, reports and records, schedules, coordination drawings, and recommendations.
   3. Coordination Drawings: Submit as required under Section 01 33 10 - SUBMITTALS. Prepare where careful coordination is required for installation of products and materials fabricated by separate entities and/or where limited space availability requires maximum utilization of space for efficient installation of different components. Show the relationship of components and required installation sequences.

C. SCHEDULING:
   1. General: Refer to Section 01 32 14 - PROGRESS SCHEDULE.
   2. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures such as preparation of schedules, installation and removal of temporary facilities, delivery and processing of submittals, progress meetings, and Project closeout activities, with other construction activities to avoid conflicts and assure orderly progress of the Work.

D. MEETINGS:
   1. General: Schedule and administer meetings throughout progress of the Work at biweekly intervals.
   2. Duties: Schedule meetings, prepare agenda with copies for participants, preside at meetings, and distribute copies of minutes within two (2) days of receipt from the City's Representative to the participants and those affected by decisions made.
   3. Attendance Required: Job superintendent, major subcontractors and suppliers, and the Architect, as appropriate to agenda topics for each meeting.
   4. Agenda: Include review of minutes of previous meeting; review of Work progress; field observations; problems and decisions; review of submittals schedule and status of submittals; review of off-site fabrication and delivery schedules; maintenance of progress schedules; corrective measures to regain projected schedules; planned progress for succeeding work period; projected progress of coordination; maintenance of quality of work standards; effect of proposed changes on progress schedule and coordination; other business relating to Work.

E. CONSTRUCTION MOBILIZATION: Coordinate the use of the site and facilities. Allocate mobilization areas of site; allow for field offices and sheds, access, traffic, and parking facilities.

2. PRODUCTS:

A. MATERIALS: Refer to Section 01 60 00 - PRODUCT REQUIREMENTS.

3. EXECUTION:

A. PERFORMANCE: Refer to Section 01 73 10 - EXECUTION REQUIREMENTS.

* * *

PROGRESS SCHEDULE Section 01 32 14

1. GENERAL:

A. DESCRIPTION: Within fifteen (15) days after award of the Contract, submit to the City estimated construction progress schedules for the Work, with sub-schedules of related activities essential to its progress.

B. RELATED REQUIREMENTS SPECIFIED ELSEWHERE: Refer to Section 01 31 00 - PROJECT MANAGEMENT AND COORDINATION for scheduling administrative procedures and project meeting requirements. Refer to General Provisions.

C. SUBMITTALS:
   1. General: Submit progress and submittal schedules in PDF form.
   2. Progress Schedule: Submit preliminary schedule for review; after review, resubmit required construction schedule with revised data within ten (10) days.
   3. Submittal Schedule: Refer to Section 01 33 10 - SUBMITTALS; paragraph 1.C.3 Submissions for submittal scheduling requirements.
   4. Revised Schedules:
      a. Progress Schedule: Submit with Application for Payment; refer to Section 01 29 00 - PAYMENT PROCEDURES.
      b. Submittal Schedules: Distribute five (5) days before initial Project Meeting; thereafter with agenda for subsequent biweekly project meetings.
   5. Distribution: Distribute copies of reviewed Schedules to project site, subcontractors, suppliers, and other concerned parties. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in Schedules.

D. CONTENT:
   1. Progress Schedule:
      a. General: Prepare network analysis system using the critical path method, as outlined in The Associated General Contractors of America (AGC) publication "The Use of CPM in Construction - A Manual for General Contractors".
      b. Content:
         1. Sequence of Listings: The chronological order of the start of each item of Work.
         2. Phases: Identify work of separate stages and other logically grouped activities. Provide sub-schedules for each stage of Work identified in Section 01 11 00 - SUMMARY OF WORK. Provide sub-schedules to define critical portions of the entire Schedule.
         3. Items of Work: Identify each item by specification section number.
         4. Percentage of Completion: Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
         5. Schedule of Values: Coordinate content with Schedule of Values specified in Section 01 29 00 - PAYMENT PROCEDURES.
   2. Submittals Schedule:
      a. General: Provide a complete list of specified Submittals by Section Number in PDF form. Maintain, update and distribute list, identifying dates of submittal receipt and return of reviewed submittals, for evaluation at scheduled biweekly project meetings.
      b. Specified Submittals: Identify required submittal dates for shop drawings, product data, and samples, etc.
      c. Reviewed Submittals: Date review of submittal will be required from City.
      d. Selection of Finishes: Indicate decision dates.

E. REVISIONS TO SCHEDULES:
   1. General: Indicate progress of each activity to date of submittal, and projected completion date of each activity.
   2. Revisions: Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
   3. Reports: Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.

2. PRODUCTS:

Not Used.

3. EXECUTION:

Not Used.

* * *

SUBMITTALS Section 01 33 10

1. GENERAL:

A. DESCRIPTION: Submit certifications, shop drawings, product data/material lists, manufacturer's instructions, and samples to the City for review as required.

B. RELATED REQUIREMENTS SPECIFIED ELSEWHERE:
   1. General: Specific submittal requirements are identified in the individual Sections of these specifications.
   2. Product Substitution Procedures: Section 01 25 00 - SUBSTITUTION PROCEDURES; products lists and substitution requests.
   3. Schedule of Values: Section 01 29 00 - PAYMENT PROCEDURES.
   4. Requests for Information (RFI): Section 01 26 31 - INFORMATION REQUEST PROCEDURE.
   5. Progress Schedule: Section 01 32 14 - PROGRESS SCHEDULE.
   6. Testing Laboratory Services: Section 01 45 23 - TESTING AND INSPECTION SERVICES; test reports.
   7. Closeout Procedures: Section 01 77 00 - CLOSEOUT PROCEDURES; operating and maintenance manuals, record drawings, and guarantees.

C. SUBMISSION PROCEDURES:
   1. General: Schedule submissions a minimum three (3) weeks before required for use.
   2. Submittal Requirements:
      a. General: Conform to specified procedures in submission of required submittals.
      b. Specified Products and Alternate Manufacturers: Products of specified manufacturers and named acceptable alternate manufacturers require submission of listed submittals.
      c. "Approved Equals" and Substitutions: See Section 01 25 00 - SUBSTITUTION PROCEDURES; requests for acceptance of products as "equal" or as substitution shall include listed submittals for subject products, requirements of the Substitution Request, and be submitted within the time frames specified in Section 01 25 00 - SUBSTITUTION PROCEDURES.
   3. Submissions:
      a. General: After issuance of Notice to Proceed make submissions no later than the following number of days, unless specified otherwise in individual specification Section.
      b. Early Start and/or Long Lead-Time Items: 30 calendar days.
      c. Color Selection Items: 30 calendar days.
      d. Electrical, Mechanical and Equipment Items: 60 calendar days.
      e. All Other Items: 90 calendar days.

D. SUBMISSION REQUIREMENTS:
   1. Cover Sheet:
      a. General: Provide a completed copy of the Submittal Cover Sheet included at the end of this Section with each submittal. Complete identified areas of the form as follows:
      b. Submittal Number: Identify first submittal as number one (1); number re-submittals, if required, with succeeding numbers.
      c. Specification Section: Identify submitted work with section number shown in the Project Manual. Provide separate submittals for each specification section, as required.
      d. Contractor: Provide company name and mailing address with signature of contact person responsible for work on this project, certifying to review of submittal, verification of field requirements and compliance with Contract Documents.
      e. Subcontractor: Provide company name, mailing address, telephone number and name of contact person responsible for work on this project.
      f. Submittal Description:
         1. General: Describe contents of submittal completely; identify if material is a resubmittal, and give previous submittal number.
         2. Submittal Index: List items included in submittal; properly cross reference to Contract Documents.
   2. Identification of Submittals:
      a. Date: Submission date and revision dates.
      b. Project: Project name and number; names of Architect, Contractor, and Subcontractor as shown on Submittal Cover Sheet.
      c. Product or Material: Name of manufacturer, product name or model number, and supplier.
      d. Contractor's Stamp: Initialed or signed, certifying to review of submittal, verification of field requirements and compliance with contract documents.

3. Number of Copies Required:
   a. Certifications, Shop Drawings, Product Data/Material Lists and Manufacturer's Instructions: One (1) electronic copy (PDF) of each submittal.
   b. Samples:
      1. General: As identified in individual specification section.
      2. Color/Pattern Selection: One set of manufacturer's complete range for initial selection; additional samples as requested of selected color/pattern for final color schedule.

E. SUBMITTALS:
1. Shop Drawings:
   a. General: Submit manufacture and installation details, including fastenings, for review. Make drawings legible and complete in every respect. Show relationship to adjacent structure or material; clearly identify all field dimensions.
   b. Variations: If shop drawings show variations from Contract requirements because of standard shop practice or other reason, specifically note such variations in letter of transmittal, as well as on drawings.
   c. Distribution: Reviewed shop drawings will be returned to Contractor for subsequent action, as required.
      1. No Resubmittal Required: Electronic copy (PDF) sent; Contractor may make copies for distribution.
      2. Resubmittal Required: Electronic copy (PDF) sent. Make corrections to original drawings and send new electronic copy (PDF) to City for review. Secure final review prior to commencing work.
2. Product Data/Material Lists:
   a. Manufacturer's Standard Schematic Drawings:
      1. General: Provide standard drawings; delete information not applicable to Project.
      2. Additional Information: Supplement standard information as required for Project.
   b. Product Data:
      1. General: Provide manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
      2. Identification: Clearly mark each copy; identify required materials, products or models.
      3. Required Information: Provide dimensions and clearances required; performance characteristics and capacities; and diagrams of equipment and controls.
   c. Distribution: Reviewed product data will be returned to Contractor for subsequent action, as required.
      1. No Resubmittal Required: Electronic copy (PDF) sent; Contractor may make copies for distribution.
      2. Resubmittal Required: Electronic copy (PDF) sent. Make corrections to original drawings and send new electronic copy (PDF) to City for review. Secure final review prior to commencing work.
3. Manufacturer's Instructions:
   a. General: Submit most recent applicable printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing of the subject material, as provided by the manufacturer for use under conditions similar to those of this Project.
   b. Distribution: Reviewed manufacturer's instructions will be returned to Contractor for subsequent action, as required.
      1. No Resubmittal Required: Electronic copy (PDF) sent; Contractor may make copies for distribution.
      2. Resubmittal Required: Electronic copy (PDF) sent. Make corrections to original drawings and send new electronic copy (PDF) to City for review. Secure final review prior to commencing work.
4. Samples:
   a. General: Submit samples to illustrate functional and aesthetic characteristics of product, with integral parts and attachment devices.
   b. Finishes: Submit manufacturer's full range of standard colors, patterns and textures.
   c. Office Samples: Provide in sufficient size and quantity to clearly illustrate product.
   d. Field Samples and Mock-Ups: Erect at Project site at location acceptable to City. Construct each sample or mockup complete, including work of trades required in finished work. After review, samples may be used in construction of project, as specified.

F. SUBMITTAL REVIEW:
1. General: Make submittals as required to cause no delay in the orderly progress of work, layout or fabrication under Contract, due allowance being made for checking by the City and for such corrections, resubmission and rechecking as may be necessary. Do not commence work requiring submittals until review by City has been completed.
2. Review: City's review will be for general conformance with the Contract Documents. Review

does not relieve Contractor from responsibility for coordinating work of various trades and compliance with requirements of Contract Documents for lengths, fit and other details, or from furnishing materials and work required by contract which may not be indicated on submittals when reviewed. Review does not authorize changes from Contract requirements. Efforts will be made by City to identify errors and omissions, but General Contractor is responsible for the accuracy and correctness of submittals.

3. Color Selections: City will make no color selections until all submittals related to color have been received and materials reviewed.

G. CERTIFICATIONS:
   1. General: Where specifically indicated by individual Sections, submit certification of recognized producer or association.
   2. Qualifications: Under various Sections of the technical specifications, under paragraph 1.D. QUALITY ASSURANCE of those Sections, certain experience requirements and other qualifications may be required. When such requirements are specified, submit written certification of such requirements to the City within thirty-five (35) days of date of Notice to Proceed.
   3. Products:
      a. Asbestos: Submit written certification that no materials containing asbestos have been included in the Work as required in Section 01 43 00 - QUALITY ASSURANCE.
      b. Volatile Organic Compounds (VOC): Provide written certification that materials used in construction operations and installed in the work comply with the requirements of the environmental protection agency having jurisdiction at the location of this Project.

2. PRODUCTS
Not Used

3. EXECUTION:
Not Used

* * *

SUBMITTAL COVER SHEET

PROJECT NAME Fire Station No. 5	JOB NO. 36907-D	SECTION NO.	SUBMITTAL NO.

SUBCONTRACTOR

NAME:

ADDRESS:

PHONE:

CONTACT:

CONTRACTOR CERTIFICATION

I hereby certify that I have reviewed the attached, and have verified field requirements and compliance with the Contract Documents.

CONTRACTOR:

ADDRESS:

SIGNED:_____ DATE: _____

SUBMITTAL DESCRIPTION

RESUBMITTAL? NO [ ] YES [ ] OF PREVIOUS SUBMITTAL NO. _____

SUBMITTAL HISTORY

DATE REC'D. FROM CONTR.

CONSULTANT REVIEW

[ ] Civil
[ ] Mechanical
[ ] Structural
[ ] Electrical
[ ] Landscape
[ ] Other

Date Sent: _____

Date Due: _____

Date Rec'd.: _____

DISTRIBUTION DATE _____

Copies to:

Contr. _____

Insp. _____

File _____

City _____

Other _____

REMARKS:

ROB WELLINGTON QUIGLEY, FAIA STAMP

Rob Wellington Quigley, FAIA
416 13th Street San Diego, CA 92101 Telephone: (619) 232-0888

SUSTAINABLE DESIGN REPORTING Section 01 33 29

1. GENERAL:

A. SUMMARY:
1. General: This Section includes general requirements and procedures for compliance with certain U.S. Green Building Council's (USGBC) LEED prerequisites and credits needed for the Project to obtain LEED Certified Silver certification.
2. Other LEED prerequisites and credits needed to obtain LEED certification are dependent on material selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests.
3. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification are dependent on the design and other aspects of the Project that are not part of the Work of the Contract.
4. Related Sections: Divisions 01 through 33 Sections for LEED requirements specific to the Work of each of those Sections. These requirements may or may not include reference to LEED.

B. DEFINITIONS:
1. Certificates of Chain-of-Custody: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria." Certificates shall include evidence that mill is certified for chain-of-custody by an FSC-accredited certification body.
2. LEED: Leadership in Energy & Environmental Design.
3. Rapidly Renewable Materials: Materials made from agricultural products that are typically harvested within a ten-year or shorter cycle. Rapidly renewable materials include products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.
4. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles from the Project location. Manufacturing refers to the final assembly of components into the building product that is installed at the Project site.
5. Regionally Extracted, Harvested, or Recovered Materials: Materials that are extracted, harvested, or recovered and manufactured within a radius of 500 miles from the Project site.
6. Recycled Content:
   a. General: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).
   b. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
   c. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

C. REFERENCES:
1. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): IAQ Guidelines for Occupied Buildings Under Construction.
2. U.S. Environmental Protection Agency (EPA):
   a. General: Guidelines for Energy Management.
   b. Indoor Air Quality (IAQ): Testing for Indoor Air Quality, Baseline IAQ, and Materials.
3. U.S. Green Building Council (USGBC):
   a. New Construction: LEED-BD+C Rating System.

D. SUBMITTALS:
1. General: LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.
2. Project Materials Cost Data: Provide statement indicating total cost for building materials used for Project. Include statement indicating total cost of mechanical and electrical components.
3. LEED Action Plans:
   a. General: Provide preliminary submittals within 30 days of date of Notice to Proceed indicating how the following requirements will be met.
   b. Credit MR 2.1 and 2.2: Waste management plan complying with Division 01 Section "Construction Waste Management."
   c. Credit MR 4.1 and 4.2:
      1. General: List of proposed materials with recycled content.
      2. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
   d. Credit MR 5.1 and 5.2:
      1. General: List of proposed regionally manufactured materials and regionally harvested or recovered materials.

2. Identify each regionally manufactured material, its source, and cost.
3. Identify each regionally harvested or recovered material, its source, and cost.

e. Credit MR 7.0:
1. General: List of proposed certified wood products.
2. Indicate each product containing certified wood, its source, and cost.
3. Include statement indicating total cost for wood-based materials used for Project, including non-rented temporary construction.

f. Credit EQ 3.1: Construction indoor air quality management plan.

4. LEED Progress Reports:
a. General: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
b. Credit MR 2.1 and 2.2: Waste reduction progress reports complying with Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
c. Credit MR 4.1 and 4.2: Recycled content.
d. Credit MR 5.1 and 5.2: Regionally manufactured materials and regionally harvested or recovered materials.

5. LEED Documentation Submittals:
a. General: In addition to the following, submit LEED Scorecard and other documentation required for LEED certification.
b. Credit SS 7.2: Product Data for roofing materials indicating Energy Star compliance.
c. Credit WE 3.1 and 3.2: Product Data for plumbing fixtures indicating water consumption.
d. Prerequisite EA 3.0: Product Data for new HVAC equipment indicating absence of CFC refrigerants.
e. Credit MR 2.1 and 2.2: Comply with Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
f. Credit MR 4.1 and 4.2: Product Data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
g. Credit MR 5.1 and 5.2:
1. General: Product Data indicating location of material manufacturer for regionally manufactured materials.
2. Include statement indicating cost and distance from manufacturer to Project for each regionally manufactured material.
3. Include statement indicating cost and distance from point of extraction, harvest, or recovery to Project for each raw material used in regionally manufactured materials.

h. Credit MR 7.0:
1. General: Product Data and certificates of chain-of-custody for products containing certified wood.
2. Include statement indicating costs for each product containing certified wood.
3. Include statement indicating total cost for wood-based materials used for Project, including non-rented temporary construction.

i. Credit EQ 1.0: Product Data and Shop Drawings for carbon dioxide monitoring system.
j. Credit EQ 3.1:
1. Construction indoor air quality management plan.
2. Product Data for temporary filtration media.
3. Product Data for filtration media used during occupancy.
4. Construction Documentation: Six photographs at three different occasions during construction along with a brief description of the SMACNA approach employed, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.

k. Credit EQ 3.2:
1. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
2. Product Data for filtration media used during flush-out and during occupancy.
3. Report from testing and inspecting agency indicating results of IAQ testing and documentation showing conformance with IAQ testing procedures and requirements.

l. Credit EQ 4.1: Product Data and material safety data sheets (MSDSs) for adhesives and sealants used on the interior of the building indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA method 24).
m. Credit EQ 4.2: Product Data and material safety data sheets (MSDSs) for paints and coatings used on the interior of the building indicating chemical composition and VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA method 24).
n. Credit EQ 4.3: Product Data for carpet products indicating VOC content of each product used.
o. Credit EQ 4.4: Product Data for composite wood and agrifiber products indicating that

products contain no urea-formaldehyde resin.
p. Include statement indicating adhesives and binders used for each product.
q. Credit EQ 6.2: Product Data and Shop Drawings for sensors and control system used to provide individual airflow and temperature controls for minimum 50 percent of non-perimeter, regularly occupied space.
r. Credit EQ 7: Product Data and Shop Drawings for sensors and control system used to monitor and control room temperature and humidity.

2. PRODUCTS:

A. SALVAGED AND REFURBISHED MATERIALS: Refer to Section 02 41 00 - DEMOLITION and 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
B. RECYCLED CONTENT OF MATERIALS:
1. Credits MR 4.1 and MR 4.2: Provide building materials with recycled content such that post-consumer recycled content constitutes a minimum of 10 percent of the cost of materials used for the Project or such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 20 percent of the cost of materials used for the Project.
2. The cost of post-consumer recycled content of an item shall be determined by dividing the weight of post-consumer recycled content in the item by the total weight of the item and multiplying by the cost of the item.
3. The cost of post consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing the weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by the total weight of the item and multiplying by the cost of the item.
a. Do not include mechanical and electrical components in the calculation.
b. Recycled content of materials shall be defined according to the Federal Trade Commission's "Guide for the Use of Environmental Marketing Claims," 16 CFR 260.7 (e).
C. REGIONAL MATERIALS:
1. Credit MR 5.0: Provide 10 percent minimum (20 percent goal) of building materials (by cost) that are regionally manufactured materials. Of the regionally manufactured materials required, provide at least 20 percent (by cost) that are regionally extracted, harvested, or recovered materials.
D. CERTIFIED WOOD:
1. Credit MR 7.0:
a. General: Provide a minimum of 50 percent (by cost) of wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."
b. Wood-based materials include but are not limited to the following materials when made from made wood, engineered wood products, or wood-based panel products:
c. Rough carpentry.
d. Miscellaneous carpentry.
e. Heavy timber construction.
f. Wood decking.
g. Metal-plate-connected wood trusses.
h. Structural glued-laminated timber.
i. Finish carpentry.
j. Architectural woodwork.
k. Wood paneling.
l. Wood veneer wall covering.
m. Wood flooring.
n. Wood lockers.
o. Wood cabinets.
p. Non-rented temporary construction, including bracing, concrete formwork, pedestrian barriers, and temporary protection.
E. LOW-EMITTING MATERIALS:
1. Credit EQ 4.1:
a. General: For interior applications use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24):
b. Wood Glues: 30 g/L.
c. Metal to Metal Adhesives: 30 g/L.
d. Adhesives for Porous Materials (Except Wood): 50 g/L.
e. Subfloor Adhesives: 50 g/L.
f. Plastic Foam Adhesives: 50 g/L.
g. Carpet Adhesives: 50 g/L.
h. Carpet Pad Adhesives: 50 g/L.
i. VCT and Asphalt Tile Adhesives: 50 g/L.

j. Cove Base Adhesives: 50 g/L.
k. Gypsum Board and Panel Adhesives: 50 g/L.
l. Rubber Floor Adhesives: 60 g/L.
m. Ceramic Tile Adhesives: 65 g/L.
n. Multipurpose Construction Adhesives: 70 g/L.
o. Fiberglass Adhesives: 80 g/L.
p. Structural Glazing Adhesives: 100 g/L.
q. Wood Flooring Adhesive: 100 g/L.
r. Contact Adhesive: 250 g/L.
s. Plastic Cement Welding Compounds: 350 g/L.
t. ABS Welding Compounds: 400 g/L.
u. CPVC Welding Compounds: 490 g/L.
v. PVC Welding Compounds: 510 g/L.
w. Adhesive Primer for Plastic: 650 g/L.
x. Sealants: 250 g/L.
y. Sealant Primers for Nonporous Substrates: 250 g/L.
z. Sealant Primers for Porous Substrates: 775 g/L.

2. Credit EQ 4.2:
   a. General: For interior applications use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the following chemical restrictions:
   b. Flat Paints and Coatings: VOC not more than 50 g/L.
   c. Non-Flat Paints and Coatings: VOC not more than 150 g/L.
   d. Anti-Corrosive Coatings: VOC not more than 250 g/L.
   e. Varnishes and Sanding Sealers: VOC not more than 350 g/L.
   f. Stains: VOC not more than 250 g/L.
   g. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   h. Restricted Components:
      1. General: Paints and coatings shall not contain any of the following:
      2. Acrolein.
      3. Acrylonitrile.
      4. Antimony.
      5. Benzene.
      6. Butyl benzyl phthalate.
      7. Cadmium.
      8. Di (2-ethylhexyl) phthalate.
      9. Di-n-butyl phthalate.
      10. Di-n-octyl phthalate.
      11. 1,2-dichlorobenzene.
      12. Diethyl phthalate.
      13. Dimethyl phthalate.
      14. Ethylbenzene.
      15. Formaldehyde.
      16. Hexavalent chromium.
      17. Isophorone.
      18. Lead.
      19. Mercury.
      20. Methyl ethyl ketone.
      21. Methyl isobutyl ketone.
      22. Methylene chloride.
      23. Naphthalene.
      24. Toluene (methylbenzene).
      25. 1,1,1-trichloroethane.
      26. Vinyl chloride.
3. Credit EQ 4.4: Do not use composite wood and agrifiber products that contain urea-formaldehyde resin.

3. EXECUTION:

A. CONSTRUCTION WASTE MANAGEMENT:
   1. Credit MR 2.1 and 2.2: Refer to Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
B. CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT:
   1. Credit EQ 3.1: Comply with SMACNA IAQ Guideline for Occupied Buildings under Construction.

2. Credit EQ 3.2:
   a. General: Conduct a two-week building air flush-out after construction ends with new filtration media and 100 percent outside air. Replace filtration media after building air flush-out.
   b. Air Flush-Out: Refer to Section 230980 - MECHANICAL COMMISSIONING.
   c. City will conduct a baseline indoor air quality testing program according to EPA Protocol for Environmental Requirements, Baseline IAQ and Materials. Payment for these services will be made by City.

* * *

Project Name: Fire Station No. 5

Date: ____________________

PROCUREMENT TRACKING
PROJECT MATERIALS INFORMATION

CSI '14 Section Number	Product Description	Quantity	Cost	Percent Recycled Content	Manufacturer Information	Documentation

Project Name: Fire Station No. 5
Date: _____

PROCUREMENT TRACKING
MATERIALS RECYCLED CONTENT

CSI '14 Section Number	Product	Company	Cost	% Post-Consumer Recycled Content	% Pre-Consumer Value ($)	% Pre-Consumer Recycled Content	% Post-Consumer Value ($)	Recycled Content Information Source

Subtotals	
Total Construction Material Value	
Less MR 3.1 Value	
Net Construction Material Value	
Division 12 Material Value	
Less MR 3.2 Value	
Net Project Material Value	
% Post-Consumer + ½ Pre-Consumer	

Project Name: Fire Station No. 5
Date: _____

PROCUREMENT TRACKING REGIONAL MATERIALS

CSI '14 Section Number	Product Name	Manufacturer	Distance Between Project Site & Manufacturer (Miles)	Product Cost ($)	Distance Between Project & Extraction Site (Miles)	Product Cost ($)	Regional Content Information Source

Component Totals
Total Construction Material Value
Division 12 Material Value
Total Project Material Value
% Manufactured Regionally
% Both Manufactured Regionally & Extracted Regionally

Project Name: Fire Station No. 5
Date: ____________________

PROCUREMENT TRACKING
LOW VOC MATERIALS

Product Name	Manufacturer	Where Installed	Chemical Contaminants	Product Information (Cut Sheet or MSDS)

ELECTRONIC MEDIA TRANSFER AGREEMENT Section 01 33 90

1. GENERAL:

A. DESCRIPTION: This section provides procedures for the Contractor's use of the computer aided design (CAD) files for preparation of submittals.

B. SUBMISSION PROCEDURES:

1. General: Submit request for electronic data transfer by signing the Agreement included at the end of this Section and sending hard copy with an appropriate explanatory transmittal to the City.
2. Time: Submit request a minimum of seven (7) days prior to the date that files are needed.

C. CITY'S RESPONSE: Files will be emailed or provided on electronic media, as requested in the transmittal. Files will be in the program used for creation of the files; any necessary translations will be the responsibility of the Contractor. City is not responsible for any problems encountered as a result of electronic transmission or translation.

D. DISTRIBUTION: Submit PDF of original, signed copy of the Agreement. Co-signed copy will be returned to the Contractor.

2. PRODUCTS:

Not Used

3. EXECUTION:

Not Used

* * *

ELECTRONIC MEDIA TRANSFER AGREEMENT

PROJECT NAME:	Fire Station No. 5 San Diego, California
ARCHITECT'S PROJECT NO.:	Job No. 36907-D
ARCHITECT:	Rob Wellington Quigley, FAIA 416 13th Street San Diego, CA 92101
CONTRACTOR:	Firm Name: Address: City, State, Zip:

Electronic media will remain the property of the Architect and its consultants and will be subject to their copyright. The Architect and its consultants will provide the Contractor only a working copy of the electronic media. Said working copy will have indices of the Architect's and consultants' ownership, professional name, and/or involvement in the project removed from the electronic display.

This computer aided design (CAD) working copy is provided for the convenience of the recipient only. The working copy represents data prepared as the Architect's and its consultants' internal set of working documents. As such it may be incomplete, contain deliberate or unintentional inaccuracies or be in part obsolete. In addition, intentional or unintentional changes to the working copy may occur during its use, storage, or translation by parties other than the Architect and its consultants, and the Architect and its consultants have no control over such changes that may occur. Therefore, the Architect and its consultants make no representation as to the completeness, currency or accuracy of the working copy. The Contractor is further warned that, while digital CAD data appears to be extremely accurate, this apparent accuracy is an artifact of the techniques used to generate it and is in no way intended to imply actual accuracy. The Contractor takes full responsibility for the accuracy and correctness of measurements, areas, inventories, etc. extracted from this data either manually or with the use of a computer, and for conclusions drawn from this data.

The Contractor is advised that translation of CAD data from one computer system or environment to another can and often does result in the loss of data. This loss can include but may not be limited to: portions of text and dimensions - the existence, location or scale of symbols or other elements of graphics - the internal structure of the data including layers and data attributes - the style or weight of lines. The Architect and its consultants make no representation as to the usability of this CAD data on any system.

The Contractor is advised to review all current and subsequent project documentation issued for inconsistencies and revisions. It is the responsibility of the Contractor to identify and make required revisions and corrections to the data on the working copy.

The Contractor acknowledges that the Architect and its consultants provide the working copy for information only and they do not represent that the electronic media will exactly correspond to the Contract Documents. A statement will be electronically placed on each working copy drawing sheet as follows: "Not for construction purposes. The Contract Documents as bid may contain additions, modifications, or deletions not shown on this working copy." Based in part, but not limited to, the foregoing discussion of the limitations and character of the working copy to be provided under this agreement, the Contractor specifically acknowledges that the working copy may be unreliable and/or inaccurate and/or incomplete. Contractor further acknowledges that it has and shall continue to have the sole responsibility for the accurate, complete, and timely production, completion, and submission of shop drawings and other documents prepared with the assistance of the working copy, and that the receipt of the working copy does not diminish or affect Contractor's duty with regard to said production, completion, or submission. As such, Contractor agrees that use of the working copy shall be undertaken solely at its own risk, and that the Architect and its consultants shall assume no liability whatsoever that may arise out of such use by the Contractor or any other party.

In furtherance of the above, and in consideration of the use of the working copy, Contractor agrees to release and, to the fullest extent permitted by law, defend, indemnify, and hold harmless the City, Architect and its partners, consultants, agent and employees from and against any and all claims, suits, actions, demands, losses, expenses, damages, penalties, and liabilities of any kind, including without limitation, attorney fees, arising out of or relating to such other use or changes to such working copy.

In addition, Contractor and Architect agree that this agreement is not a construction contract within the scope of California Civil Code section 2782.

Contractor shall ensure that any subcontractor to whom he permits access to the working copy shall be bound in writing to all the terms of this agreement.

Contractor and Architect agree that this agreement represents the total agreement between them, and incorporates all prior written and oral understandings. Contractor and Architect further agree that clauses and provisions of this contract are to be severable from one another, and in the event that one or more clauses or provisions of this contract are declared illegal or otherwise invalid by a court of competent jurisdiction, that all other clauses and provisions of the contract that remain shall be of full force and effect.

Accepted by:	Accepted by:
_____	_____
Contractor's Representative	Architect's Representative
Date: _____	Date: _____

* * *

REFERENCES Section 01 42 00

1. GENERAL:

A. SUMMARY
1. Description:
   a. General: Standards, codes, definition of words and terms, are identified in this Section.
   b. Additional Instructions: Refer to 00 01 08 - USER GUIDE FOR THE PROJECT MANUAL.
2. Related Work:
   a. General: The following items of Work are related to the Work of this Section but specified elsewhere in this Project Manual.
   b. Quality Standards: Refer to Section 01 43 00 - QUALITY ASSURANCE.

B. REFERENCES:
1. General: References are made throughout the technical specifications to various standard specifications, codes, practices, and requirements for materials, work quality, installation, inspections and tests, which are published and issued by the organizations, societies and associations listed below by abbreviation and name.
2. Referenced Standards: Obtain copies direct from publication sources as needed for proper performance and completion of the Work. Addresses for these organizations are available from the City.

C. STANDARDS: All references to established Standards mean and include the latest edition of such Standards, as of the date of issue of this Project Manual.

D. CODES:
1. General: Work of this project shall conform to applicable codes, current editions with applicable amendments, as adopted by enforcing agencies.
2. Applicable Codes:
   a. California Building Code (CBC):
      1. General: California Building Standards Commission.
      2. Building Standards Administrative Code: Title 24, Part 1.
      3. Building Code: Volume 1 and 2; Title 24, Part 2, Volume 1 and 2.
      4. Electrical Code: Title 24, Part 3.
      5. Mechanical Code: Title 24, Part 4.
      6. Plumbing Code: Title 24, Part 5.
      7. Energy Code: Title 24, Part 6.
      8. Elevator Construction Safety Code: Title 24, Part 7.
      9. Fire Code: Title 24, Part 9.
      10. Green Building Standards Code: Title 24, Part 11.
      11. Referenced Standards Code: Title 24, Part 12.
   3. Americans with Disabilities Act (ADA): Latest edition; Civil Rights Division, Office on the Americans with Disabilities Act, U.S. Department of Justice
   4. National Fire Protection Association (NFPA): Life Safety Code - NFPA 101.
   a. U. S. Environmental Protection Agency (EPA): Laws and regulations.
   b. California Environmental Protection Agency (CalEPA): State regulations and standards.
   c. California Integrated Waste Management Board:
      1. General: Sustainable Building Guidelines.
      2. Construction Waste Management: Construction and Demolition Debris Recycling.
   d. California State Water Resources Control Board (SWRCB): SWPPP Standards.
   e. Public Utilities: Rules, regulations and standards of jurisdictional agencies.

E. DEFINITIONS:
1. Words and Terms:
   a. General: The following are used in addition to those defined in the General Conditions, and are defined as follows:
   b. Approved Equal: Reviewed and accepted by the City as being equal in quality, utility and appearance.
   c. Approved: As accepted by the City.
   d. As Required: As required by regulatory requirements, referenced standards, existing conditions, or by the Contract Documents.
   e. Directed: As instructed by the City in writing.
   f. Furnish: Supply and deliver to the site.
   g. Indicated: As shown, noted, or scheduled on the Drawings.
   h. Install: Anchor, fasten, or connect in place and adjust for use; place or apply in proper position and location; establish in place for use or service.
   i. Provide: Furnish and install.
   j. Site: Area to be occupied by the Project. Use of the word "jobsite" or "site" shall be

interpreted to be synonymous with "site of the Work" or "Work Site".

2. Abbreviations:
   a. General: Definition of abbreviations and symbols used on the Drawings are identified on the Drawings.
   b. Governing Dictionary: The definitions of words and abbreviations used in these Specifications are given in "The American Heritage Dictionary of the English Language".

2. PRODUCTS:

A. GENERAL: The reference standards applicable to this Project are specifically identified in the technical specification Sections listed in the Table of Contents - Divisions 02 through 33.

B. ASSOCIATION AND AGENCY NAMES: The following abbreviation or acronym shall be understood to mean the full name of the respective organization or document, as follows:

A

American Association of Automatic Door Manufacturers (AAADM)
Aluminum Association (AA)
Associated Air Balance Council (AABC)
Aluminum Anodizers Council (AAC)
American Architectural Manufacturers Association (AAMA)
Association of Asphalt Paving Technologists (AAPT)
American Association of Radon Scientists and Technologists (AARST)
American Association of State Highway and Transportation Officials (AASHTO)
American Association of Textile Chemists and Colorists (AATCC)
Amateur Athletic Union (AAU)
American Association of Wood Turners (AAW)
American Boiler Manufacturers Association (ABMA)
American Coal Ash Association (ACAA)American Copper Council (ACC)
Air Conditioning Contractors Association (ACCA)
American Consulting Engineers Council (ACEC)
American Concrete Institute (ACI)
American Construction Inspectors Association (ACIA)
American Council of Independent Laboratories (ACIA)
American Concrete Pavement Association (ACPA)
American Concrete Pumping Association (ACPA)
American Concrete Pipe Association (ACPA)
American Concrete Pressure Pipe Association (ACPPA)
Americans with Disabilities Act (ADA)
Art Dealers Association of America (ADAA)
Air Diffusion Council (ADC)
Air Distribution Institute (ADI)
American Extruders Council (AEC)
Audio Engineering Society (AES)
Automatic Fire Alarm Association (AFAA)
American Fence Association (AFA)
American Fiberboard Association (AFA)
American Floorcovering Alliance (AFA)
Anti-Friction Bearing Manufacturers Association (AFBMA)
Association for Facilities Engineering (AFE)
American Furniture Manufacturers Association (AFMA)
American Forest and Paper Association (AFPA)
American Fire Sprinkler Association (AFSA)
American Galvanizers Association (AGA)
American Gas Association (AGA)
Art Glass Association (AGA)
Associated General Contractors of America (AGC)
Automated Guided Vehicle Systems Section of the Material Handling Institute (AGVS)
Association of Home Appliance Manufacturers (AHAM)
American Hardwood Export Council (AHEC)
American Hardware Manufacturers Association (AHMA)
Appalachian Hardwood Manufacturers Association (AHMA)
Asphalt Institute (AI)
American Institute of Architects (AIA)
American Insurance Association (AIA)
American Industrial Hygiene Association (AIHA)
American Institute of Steel Construction (AISC)
American Iron and Steel Institute (AISI)

American Institute of Timber Construction (AITC)
American Lighting Association (ALA)
Associated Landscape Contractors of America (ALCA)
American Ladder Institute (ALI)
Associated Locksmiths of America (ALOA)
American Lumber Standards Committee, Inc. (ALSC)
Air Movement and Control Association International, Inc. (AMCA)
Architectural Metal Products Division of NAAMM (AMP)
American Nursery and Landscape Association (ANLA)
American National Standards Institute (ANSI)
American Planning Association (APA)
The Engineered Wood Association (APA)
American Portland Cement Alliance (APCA)
American Pipe Fitters Association (APFA)
American Petroleum Institute (API)
American Park and Recreation Society (APRS)
American Public Works Association (APWA)
American Rolling Door Association (ARDA)
Association of Refrigerant and Desuperheating Manufacturers (ARDM)
Air-Conditioning and Refrigeration Institute (ARI)
Asphalt Roofing Manufacturers Association (ARMA)
Asphalt Recycling and Reclaiming Association (ARRA)
American Road and Transportation Builders Association (ARTBA)
Air-conditioning and Refrigeration Wholesalers International (ARWI)
Acoustical Society of America (ASA)
Adhesive and Sealant Council (ASC)
Alliance to Save Energy (ASE)
American Society of Consulting Arborists(ASCA)
American Society of Concrete Contractors (ASCC)
American Society of Civil Engineers (ASCE)
American Society of Furniture Designers (ASFD)
American Society of Golf Course Architects (ASGCA)
American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
American Society of Interior Designers (ASID)
American Society of Landscape Architects (ASLA)
American Society of Mechanical Engineers (ASME)
American Society of Plumbing Engineers (ASPE)
American Society of Interior Designers (ASID)
Automated Storage/Retrieval Systems (AS/RS)
American Society of Sanitary Engineering (ASSE)
American Society for Testing and Materials (ASTM)
Alliance for Telecommunications Industry Solutions (ATIS)
American Textile Manufacturers Institute (ATMI)
Association of Vacuum Equipment Manufacturers (AVEM)
Association of Wall and Ceiling Industries-International (AWCII)
Association of Woodworking and Furnishings Suppliers (AWFS)
Architectural Woodwork Institute (AWI)
American Wood Preservers Association (AWPA)
American Wood Preservers Institute (AWPI)
American Welding Society (AWS)
American Water Works Association (AWWA)
American Zinc Association (AZA)

B

Bath Enclosure Manufacturers Association (BEMA)
Bare Granite Association (BGA)
Bureau of Home Furnishings and Thermal Insulation, State of California, Dept. of Consumer Affairs (BHFTI)
Builders Hardware Manufacturers Association (BHMA)
Brick Industry Association (BIA)
Business and Institutional Furniture Manufacturer's Association (BIFMA)
Building Owners and Managers Association International (BOMA)
Building Stone Institute (BSI)

C

Compressed Air and Gas Institute (CAGI)
California Occupational Safety and Health Administration (CalOSHA)

State of California, Department of Transportation (CalTrans)
California Stormwater Quality Association (CASQA)
Color Association of the United States (CAUS)
Copper and Brass Fabricators Council (CBFC)
Copper and Brass Servicecenter Association (CBSA)
Certified Ballast Manufacturers (CBM)
Carpet Cushion Council (CCC)
Copper Development Association (CDA)
Conveyor Equipment Manufacturers Association (CEMA)
California Forestry Association (CFA)
Chemical Fabrics and Film Association, Inc. (CFFA)
Compressed Gas Association (CGA)
Ceiling and Interior Systems Construction Association (CISCA)
Cast Iron Soil Pipe Institute (CISPI)
Chain Link Fence Manufacturing Institute (CLFMI)
Construction Management Association of America (CMAA)
Composite Panel Association (CPA)
Concrete Pipe Association (CPA)
Ceramic Manufacturers Association (CMA)
Crane Manufacturers Association (CRA)
California Redwood Association (CRA)
Conference of Radiation Control Program Directors (CRPD)
Carpet and Rug Institute (CRI)
Custom Roll Forming Institute (CRFI)
Concrete Reinforcing Steel Institute (CRSI)
Concrete Foundations Institute (CFI)
Conference for Responsible Waste Incineration (CRWI)
Concrete Sawing and Drilling Association (CSDA)
Commercial Standard (CS), U.S. Department of Commerce
Conveyor Section of the Materials Handling Institute (CS)
Canadian Standards Association (CSA)
Central Station Alarm Association (CSAA)
Cast Stone Institute (CSI)
Construction Specifications Institute (CSI)
Chimney Safety Institute of America (CSIA)
California State Industrial Accident Commission (CSIAC)
U.S. Consumer Product Safety Commission (CPSC)
Cedar Shingle and Shake Bureau (CSCB)
Ceramic Tile Institute of America (CTI)
Composite Wood Council (CWC)

D

Door Access Systems Manufacturers Association International (DASMA)
Diesel Engine Manufacturers Association (DEMA)
Design Build Institute of America (DBIA)
Door Hardware Institute (DHI)
Ductile Iron Pipe Research Association (DIPRA)
Ductile Iron Society (DIS)
State of California, Division of the State Architect, Office of Regulation Services (DSA)

E

Expanded Clay Shale and Slate Institute (ECSSI)
Energy Communication and Electrical Association (ECEA)
Energy Efficient Lighting Association (EELA)
Institute of Electrical and Electronics Engineers (IEEE)
Electronic Industries Association (EIA)
Environmental Information Association (EIA)
EIFS Industry Manufacturers Association (EIMA)
Electrical Generating Systems Association (EGSA)
European Committee for Standardization (CEN)
Expansion Joint Manufacturers Association (EJMA)
Expanded Metal Manufacturers Association Division of NAAMM (EMMA)
Electric Power Supply Association (EPSA)
ETL Testing Laboratories (ETL)

F

Federal Communications Commission (FCC)
Fluid Controls Institute (FCI)
Floor Covering Installation Contractors Association (FCICA)
Forrest Certification Resource Center (FCRC)
Fire Equipment Manufacturers Association (FEMA)
Food Equipment Manufacturers Association (FEMA)
Flat Glass Marketing Association (FGMA) is now part of Glass Association of North America (GANA)
Forging Industry Association (FIA)
Factory Mutual Research and Engineering Corporation (FM) is now part of Intertec Testing Services (ITS)
Forrest Products Society (FPS)
Food Processing Machinery and Supplies Association (FPMSA)
Fabricators and Manufacturers Association International (FMA)
Forrest Resources Association (FRA)
Federal Specification - Generals Services Administration (FS)
Fire Suppression Systems Association (FSSA)

G

Gypsum Association (GA)
Gas Appliance Manufacturers Association (GAMA)
Golf Course Builders Association of America (GCBA)
Glass Association of North America (GANA)
Germany Institute for Standardization (GIS) - Deutches Institut fur Normung (DIS)

H

Hardwood Council (HC)
Heat Exchange Institute (HEI)
Home Furnishings Association International Association (HFIA)
Hydraulic Institute (HI)
Hollow Metal Manufacturers Association Division of NAAMM (HMMA)
Hardwood Manufacturers Association (HMA)
Hardwood Plywood and Veneer Association (HPVA)
U.S. Department of Housing and Urban Development (HUD)

I

International Association of Electrical Inspectors (IAEI)
International Association of Plumbing and Mechanical Officials (IAPMO)
International Association of Lighting Designers (IALD)
International Copper Association (ICA)
Insulation Contractors of America (ICAA)
Insulated Cable Engineers Association (ICEA)
International Concrete Repair Institute (ICRI)
International Cast Polymer Association (ICPA)
Interlocking Concrete Pavement Institute (ICPI)
International Compressor Remanufacturers Association (ICRA)
Independent Electrical Contractors (IEC)
International Erosion Control Association (IECA)
Institute of Electrical and Electronics Engineers (IEEE)
Illuminating Engineering Society of North America (IES)
International Electrical Testing Association (IETA)
Industrial Fasteners Institute (IFA)
Industrial Fabrics Association International (IFAI)
International Firestop Council (IFC)
Independent Forest Products Association (IFPA)
International Furnishings and Design Association (IFDA)
Independent Glass Association (IGA)
Insulating Glass Certification Council (IGCC)
Insulating Glass Manufacturers Alliance (IGMA)
International Ground Source Heat Pump Association (IGSHPA)
Industrial Heating Equipment Association (IHEA)
International Interior Design Association (IIDA)
Institute of Noise Control Engineering (INCE)
Indiana Limestone Institute of America (ILIA)
International Masonry Institute (IMI)
International Municipal Signal Association (IMSA)
Association of the Nonwoven Fabrics Industry (INDA)

International Titanium Association (ITA)
Intertek Testing Services (ITS)
International Sign Association (ISA)
Instrument Society for Measurement and Control (ISA)
International Sanitary Supply (ISSA)
Insulated Steel Door Institute (ISDI)
International Standards Organization (ISO)
Iron and Steel Society (ISS)
International Slurry Surfacing Association (ISSA)
International Window Cleaning Association (IWCA)
International Window Film Association (IWFA)
International Wood Products Association (IWPA)

J

Joint Industry Board of the Electrical Industry (JIBEI)

K

Kitchen Cabinet Manufacturers Association (KCMA)

L

Lead Industries Association, Inc. (LIA)
Light Gage Steel Engineers Association (LGSEA)
Laminating Materials Association (LMA)
Loading Dock Equipment Manufacturers Association (LDEMA)
Lift Manufacturers Product Section of the Materials Handling Institute (LMP)
Lightning Protection Institute (LPI)
Lighting Research Center (LRC)
Laminators Safety Glass Association (LSGA) is part of Glass Association of North America (GANA)

M

Modular Building Institute (MBI)
Metal Building Manufacturers Association (MBMA)
Modular Building Systems Council (MBSC)
Metal Construction Association (MCA)
Masonry Contractors of America (MCAA)
Mechanical Contractors Association of America (MCAA)
Maple Flooring Manufacturers Association (MFMA)
Metal Framing Manufacturers Association (MFMA)
Material Handling and Management Society (MHMS)
Marble Institute of America (MIA)
Masonry Institute of America (MIA)
Metal Bar and Grating Division of NAAMM (MBG)
Masonry Society (MS)
Manufacturers Standardization Society of the Valve and Fittings Industry (MSSVFI)
Metal Treating Institute (MTI)

N

National Aggregate Association NAA)
National Arborist Association (NAA)
National Alarm Association of America (NAAA)
National Association of Architectural Metal Manufacturers (NAAMM)
National Antique and Art Dealers Association (NAADA)
North American Electric Reliability Council (NAERC)
North American Association of Food Equipment Manufacturers (NAAFEM)
North American Insulation Manufacturers Association (NAIMA)
North American Laminate Floor Association (NALFA)
National Association of Metal Finishers (NAMF)
National Association of Noise Control Officials (NANCO)
National Asphalt Pavement Association (NAPA)
National Association of Reinforcing Steel Contractors (NARSC)
National Association of Relay Manufacturers (NARM)
North American Steel Framing Alliance (NASFA)
National Association of Store Fixture Manufacturers (NASFM)
National Association of Vertical Transportation Professionals (NAVTP)
National Association of Women in Construction (NAWIC)
North American Wholesale Lumber Association (NAWLA)
National Board of Boiler and Pressure Vessel Inspectors (NBBPVI)
National Burglar and Fire Alarm Association (NBFAA)

National Board of Fire Underwriters (NBFU) - See American Insurance Association (AIA)
National Blacksmith and Welders Association (NBWA)
National Collegiate Athletic Association (NCAA)
National Council of Acoustical Consultants (NCAC)
National Concrete Masonry Association (NCMA)
National Certified Pipe Welding Bureau (NCPWB)
National Clay Pipe Institute (NCPI)
National Councill of Qualification for Lighting Professions (NCQLP)
National Council on Radiation Protection and Measurements (NCRPM)
National Corrugated Steel Pipe Association (NCSPA)
National Elevator Contractors Association (NECA)
National Elevator Industry, Inc. (NEII)
National Electrical Manufacturers Association (NEMA)
International Electrical Testing Association (NETA)
National Forestry Association (NFA)
Northwest Forestry Association (NFA)
National Frame Builders Association (NFBA)
National Fire Protection Association (NFPA)
National Fenestration Rating Association (NFRA)
National Fire Sprinkler Association (NFSA)
National Glass Association (NGA)
National Home Furnishings Association (NHFA)
National Hardwood Lumber Association (NHLA)
National Insulation Association (NIA)
National Institute of Steel Detailing (NISD)
National Institute of Standards and Technology (NIST)
National Kitchen & Bath Association (NKBA)
National Landscape Association (NLA)
National Lime Association (NLA)
Northwestern Lumber Association (NLA)
National Lighting Bureau (NLB)
National Lumber Grades Authority (NLGA)
Northeastern Lumber Manufacturers Association (NLMA)
National Metal Decorators Association (NMDA)
National Metal Spinners Association (NMSA)
National Oak Flooring Manufacturers Association (NOFMA)
National Ornamentation and Miscellaneous Metals Association (NOMMA)
National Particleboard Association (NPA) Division of the Composite Panel Association (CPA)
National Paint and Coatings Association (NPCA)
National Precast Concrete Association (NPCA)
National Refrigeration Contractors Association (NRCA)
National Roofing Contractors Association (NRCA)
National Roof and Deck Contractors Association (NRDA)
National Roofing Foundation (NRF)
National Ready-Mix Concrete Association (NRMCA)
National Stone Association (NSA)
National Sunroom Association (NSA)
National Sash and Door Jobbers Association (NSDJA)
National Sanitation Foundation International (NSF)
National Standard Plumbing Code Committee (NSPCC)
National Swimming Pool Foundation (NSPF)
National Stone, Sand and Gravel Association (NSSGA)
National Spa and Pool Institute (NSPA)
National Society of Professional Engineers (NSPE)
National School Supply and Equipment Association (NSSEA)
National Tile Contractors Association (NTCA)
National Terrazzo and Mosaic Association (NTMA)
National Wood Flooring Association (NWFA)

O

Occupational Safety and Health Administration (OSHA)
State of California, Office of Public School Construction (OPSC)
State of California, Office of Statewide Health Planning and Development (OSHPD)

P

Power Actuated Tool Manufacturers' Institute, Inc. (PATMI)

Portland Cement Association (PCA)
Power and Communication Contractors Association (PCCA)
Precast/Prestressed Concrete Institute (PCI)
Painting and Decorating Contractors of America (PDCA)
Plumbing and Drainage Institute (PDI)
Primary Glass Manufacturers Council (PGMC)
Plumbing-Heating-Cooling Contractors Association (PHCCA)
Polyisocyanurate Manufacturers Association (PIMA)
Precision Metalforming Association (PMA)
Project Management Institute (PMI)
Plumbing Manufacturers Institute (PMI)
Plastics and Metal Products Manufacturers Association (PMPMA)
Porcelain Enamel Institute (PEI)
Plastics Institute of America (PIA)
Plastic Pipe Institute (PPI)
Polyurethane Manufacturers Association (PMA)
Product Standard (PS), National Bureau of Standards
Portable Sanitation Association International (PSA)
Plastic Soft Materials Manufacturers Association (PSMMA)

Q

None

R

Rainforest Alliance (RA)
Roof Consultants Institute (RCI)
Roof Coating Manufacturers Association (RCMA)
Refrigeration Engineers and Technicians Association (RETA)
Resilient Floor Covering Institute (RFCI)
Reflective Insulation Manufacturers Association (RIMA)
Redwood Inspection Service (RIS) Division of the California Redwood Association (CRA)
Rubber Manufacturers Association (RMA)
Refactory Metals Association (RMA)
Rack Manufacturers Institute (RMI)
Roof Tile Institute (RTI)

S

Scientific Apparatus Makers Association (SAMA)
Society of American Registered Architects (SARA)
Specifications Consultants in Independent Practice (SCIP)
Southern Cypress Manufacturers Association (SCMA)
Scientific Certification Systems (SCS)
Steel Deck Institute (SDI)
Steel Door Institute (SDI)
Steel Erectors Association of America (SEAA)
Structural Engineering Institute (SEI)
State of California, State Fire Marshal (SFM)
Society of Fire Protection Engineers (SFPE)
Stained Glass Association of America (SGAA)
Safety Glazing Certification Council (SGCC)
Society of Glass and Ceramic Decorators (SGCD)
Structural Insulated Panel Association (SIPA)
Security Industry Association (SIA)
Scaffolding Industry Association (SIA)
Society for Information Display (SID)
Sealed Insulating Glass Manufacturers Association (SIGMA)
Steel Joist Institute (SJI)
Southeastern Lumber Manufacturers Association (SLMA)
Screen Manufacturers Association (SMA)
Stucco Manufacturers Association (SMA)
Steel Manufacturers Association (SMA)
Storage Equipment Manufacturers Association (SMA)
Shelving Manufacturers Association (SMA)
Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
Southern Pine Council (SPC)
Society of Plastics Engineers (SPE)

Steel Plate Fabricators Association (SPFA)
Southern Pine Inspection Bureau (SPIB)
Single-Ply Roofing Institute (SPRI)
Steel Recycling Institute (SRI)
Scaffolding, Shoring and Forming Institute (SSFI)
Specialty Steel Industry of North America (SSINA)
Steel Stud Manufacturers Association (SSMA)
Steel Structures Painting Council (SSPC)
Sump and Sewage Pump Manufacturers Association (SSPMA)
Steel Tank Institute (STI)
Steel Tube Institute of North America (STINA)
Steel Window Institute (SWI)
Submersible Water Pump Association (SWPI)
Sealant, Waterproofing and Restoration Institute (SWRI)

T

Tilt-up Concrete Association (TCA)
Tile Council of North America (TCNA)
Timber Framing Business Council (TFBC)
Tropical Forest Foundation (TFF)
Turf and Ornamental Communicators Association (TOCA)
Turfgrass Producers Council (TPC)
Tube and Pipe Association International (TPA/FMA)
Truss Plate Institute (TPA)

U

Underwriters Laboratories, Inc. (UL)
United Lightening Protection Association (ULPA)
Uni-Bel PVC Pipe Association (UNI)
U.S. Department of Agriculture (USDA), Forest Products Laboratory
U.S. Consumer Products Safety Commission (CPSC)
U.S. Green Building Council (USGBC)
U.S. Environmental Protection Agency (USEPA)
U.S. General Services Administration (USGSA)
U.S. National Committee of the International Commission on Illumination (USNC/CIE)
United States Sign Council (USSC)
United States Pharmacopoeial Convention (USP)
United States Tennis Court and Track Builders Association (US&TCBA)

V

Valve Manufacturers Association of America (VMA)
Vinyl Siding Institute (VSI)

W

Wallcoverings Association (WA)
West Coast Lumber Inspection Bureau (WCLIB)
Window Covering Manufacturers Association (WCMA)
Window and Door Manufacturers Association (WDMA)
Women Construction Owners and Executives U.S.A. (WCOE)
Wire Fabricators Association (WFA)
World Forrest Association (WFA)
World Floorcoverings Association (WFCA)
Western Hardwood Association (WHA)
Western Wall and Ceiling Contractors Association (WWCCA)
Wiring Harness Manufacturers Association (WHMA)
Woodwork Institute (WI)
Warnock Hersey, Inc. (WH) is now part of Intertec Testing Services (ITS)
Wood Molding and Millwork Producers Association (WWMPA)
Wood Products Manufacturers Association (WPMA)
World Squash Federation (WSF)
Western Red Cedar Lumber Association (WRCLA)
Wire Reinforcement Institute (WRI)
Water Systems Council (WSC)
Western States Clay Products Association (WSCPA)
Wood and Synthetic Flooring Institute (WSFI)
Western States Roofing Contractors Association (WSRCA)
Wood Truss Council of America (WTCA)

Western Wood Products Association (WWPA)
Woven Wire Products Association (WWPA)

X

None

Y

None

Z

None

3. EXECUTION:

Not Used

* * *

QUALITY ASSURANCE Section 01 43 00

1. GENERAL:

A. DESCRIPTION:
1. General: This section includes administrative and procedural requirements for quality assurance.
2. Workmanship: Quality of work.
3. Tolerances: Finished surfaces.
4. Protection of Wood: Moisture and damage.

B. REFERENCES:
1. General: Refer to Section 01 42 00 - REFERENCES. Products or workmanship specified in the Project Manual by association, trade, or other consensus standards shall conform to the requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
2. Contractual Relationship: The contractual duties and responsibilities of the parties of the Contract and those of the Architect shall not be altered from the requirements of the Contract Documents by any statement or inference in any reference document.

C. TESTING: Refer to Section 01 45 23 - TESTING AND INSPECTION SERVICES.

2. PRODUCTS:

A. GENERAL: Refer to Section 01 60 00 - PRODUCT REQUIREMENTS assure a consistent quality of products furnished by suppliers and manufacturers as indicated throughout the Project Manual.

3. EXECUTION:

A. PERFORMANCE
1. General: Refer to Section 01 73 10 - EXECUTION REQUIREMENTS.
2. Workmanship: Perform shop and field work with mechanics, craftspersons, artisans, and workers skilled and experienced in the fabrication and installation of work specified. Install and erect work plumb, level, square, and true, or true to indicated angle, and in proper alignment and relationship to other work. Finished work shall be free from defects and damage. Quality of work shall conform to the highest established standards and practices of the various trades required. The City reserves the right to reject materials and work quality which does not meet accepted standards. Repair or replace substandard material or work as directed, at no additional cost to the City.

B. INSTALLATION
1. General: Conduct quality control in concert with suppliers, products, services, site conditions, and workmanship, to produce work of specified quality.
2. Manufacturer's Instructions:
   a. General: Follow manufacturer's instructions, including each step in progression of installation. If manufacturer's instructions conflict with Contract Documents, request clarification from City before commencing Work.
   b. Installer: Manufacturer approved, as required in the technical sections of the Project Manual.
   c. Field Services: Coordinate with manufacturer of a product, system, or assembly which requires special knowledge and skill for proper application/installation of the product, system, or assembly to obtain field service, consultation and inspection as required for the application/installation work at no additional cost to the City.
3. Reference Standards: Conform to specified standards as minimum quality for the Work except where more stringent codes or specified requirements indicate higher standards or more precise workmanship.
4. Anchorage: Secure products in place with positive anchorage devices designed and sized to withstand stress, vibration, physical distortion, or disfigurement.
5. Tolerances:
   a. General: Adjust products to appropriate dimensions; position before securing in place. Monitor and control tolerances of installed products to produce acceptable Work.
   b. Finished Wall Surfaces: Plumb; maximum variation of 1/8 inch in 8'-0" when a straightedge is laid on the surface in any direction, and no measurable variation in any 2'-0" direction.
   c. Finished Ceiling Surfaces: True and level; maximum variation of 1/8 inch in 8'-0" when a straightedge and water level are laid on the surface in any direction, and no measurable variation in any 2'-0" direction.
   d. Floor Surfaces:
      1. Concrete Floors: Tolerances for concrete floors and pavement are specified in Section 03 30 00 - CAST-IN-PLACE CONCRETE.
      2. Finished Floors: Level to within plus or minus 1/8 inch in 10'-0" for resilient floor coverings.

6. Protection of Wood:
   a. General: Provide protection of wood materials and products, whether or not installed, including erected and installed wood framing and sheathing, from water and moisture until completion and acceptance of the Project. Keep informed of weather conditions and forecasts and, when there is a likelihood of rain, protect installed and exposed framing and sheathing and stored lumber exposed to the elements with suitable water-repellent coverings, such as canvas/tarpaulins or polyethylene sheeting.
   b. Finish Materials: Keep millwork and trim, paneling, cabinets, shelving, and products manufactured from wood under cover and dry at shop until time of delivery. Do not deliver fabricated finish materials to the site until the building is roofed, and exterior walls are sheathed and protected with building paper as a minimum, the doors and windows are installed and glazed, and there is ample interior storage space for such materials and products. Do not deliver during periods of rain or heavy fog.
   c. Moisture Damage: Wood materials or products which become wet from rain, dew, fog, or other source will be considered to have moisture damage and will be rejected, requiring replacement by the Contractor with new, dry materials or products at no additional cost.

* * *

TESTING AND INSPECTION SERVICES Section 01 45 23

1. GENERAL:

A. DESCRIPTION: This section includes administrative and procedural requirements for testing laboratory services for inspections, tests, and related actions, including reports prepared by Contractor, by independent agencies, and by governing authorities.

B. TESTING LABORATORY:
   1. General: Contractor shall employ and pay for services of an independent testing laboratory to perform specified testing.
   2. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
   3. Cooperation: Cooperate with laboratory to facilitate required services.
   4. Performance of Work: Employment of laboratory shall not relieve Contractor's obligations to perform work of Contract.

C. INSPECTION SERVICES: Refer to General Provisions.

D. REQUIREMENTS:
   1. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.
   2. Respective Sections of the Specifications: Certification of products.
   3. Listed Specification Sections: Laboratory tests required and standards for testing.
   4. Testing Laboratory Inspection, Sampling and Testing is required for:
      a. Concrete Reinforcement: Section 03 20 00 - CONCRETE REINFORCING.
      b. Cast-in-Place Concrete: Section 03 30 00 - CAST-IN-PLACE CONCRETE.
      c. Concrete Unit Masonry: Section 04 22 00 - CONCRETE UNIT MASONRY.
      d. Structural Steel: Section 05 12 00 - STRUCTURAL STEEL FRAMING.
      e. Earthwork: Section 31 20 10 - EARTHWORK.
      f. Asphalt Concrete Paving: Section 32 12 16 - ASPHALT PAVING.

2. PRODUCTS:

A. SUBMITTALS:
   1. General: Refer to Section 01 33 10 - SUBMITTALS.
   2. Testing Laboratory: Submit electronic copy (PDF) of certified written report, of each inspection, test, or similar service.

3. EXECUTION:

A. LABORATORY DUTIES:
   1. General: Comply with ASTM E329 "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction".
   2. Cooperation: Cooperate with City, Engineer and Contractor; provide qualified personnel after due notice.
   3. Services:
      a. General: Perform specified inspections, sampling and testing of materials and methods of construction.
      b. Specified Standards: Verify compliance.
      c. Specified Materials: Ascertain compliance with requirements of Contract Documents.
   4. Notification: Promptly inform City and Engineer of observed irregularities or deficiencies of work or products.
   5. Reports: Submit as required.
   6. Additional Testing: Perform additional tests as required by City.

B. LIMITATIONS OF AUTHORITY OF TESTING LABORATORY: Laboratory is not authorized to release, revoke, alter or enlarge on requirements of Contract Documents, or perform any construction duties of Contractor.

C. CONTRACTOR'S RESPONSIBILITIES:
   1. Cooperation:
      a. Scheduling: Notify laboratory sufficiently in advance of operations, as specified under individual Sections of the specifications, to allow laboratory to schedule tests and assign personnel. When tests or inspections cannot be performed after such notice, reimburse City for laboratory personnel and travel expenses incurred.
      b. Laboratory Personnel: Cooperate with, provide access to Work, and to manufacturer's operations.
      c. Inspector: Cooperate with Inspector to secure and deliver to laboratory adequate quantities of representative samples of materials proposed for use and that require testing.

2. Manufacturer's Test Reports: Furnish copies of products test reports as required.
3. Incidental Labor and Facilities: Provide access to Work to be tested; facilitate inspections and tests.
4. Additional Testing: Paid for by City and backcharged to Contractor as specified in the individual sections.
5. Repair and Protection: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Refer to Section 01 73 29 - CUTTING AND PATCHING.

* * *

TEMPORARY FACILITIES AND CONTROLS Section 01 50 00

1. GENERAL:

A. DESCRIPTION: Furnish and install temporary facilities and controls as specified, plus other unspecified temporary facilities, including labor, materials, services, utilities, and equipment, as may be required for proper performance of the contract, except as otherwise provided.

B. RELATED WORK SPECIFIED ELSEWHERE:
   1. Earthwork: Section 31 20 10 - EARTHWORK.
   2. Permanent Utilities: Pertinent specification Sections.

C. REQUIREMENTS OF REGULATORY AGENCIES:
   1. General: Temporary facilities and controls shall be approved by appropriate authorities and regulatory agencies, including insurance companies, for safety precautions, operation and fire hazard.
   2. Associated General Contractors of America (AGC): "Manual of Accident Prevention in Construction".
   3. California Occupational Safety and Health Administration (CalOSHA): Construction Safety Orders; 29 CFR, PART 1926 Safety and Health Regulations for Construction.
   4. California Division of Occupational Safety and Health (DOSH): Title 8 - Construction Safety Orders.

D. PRODUCT HANDLING:
   1. Protection: Protect and maintain temporary facilities and controls in proper and safe condition throughout progress of work.
   2. Replacements: Immediately repair or replace lost or damaged temporary facilities or controls.

2. PRODUCTS:

A. TEMPORARY UTILITIES: Provide water, electricity, gas and other specified utility services required during construction and extend service lines to construction areas; allow use by all trades.
   1. Temporary Water:
      a. General: Provide and pay for ample supply of potable water from sources off site.
      b. Temporary Connections: Provide connections to source and sufficient hose or pipe to carry water to all required locations.
   2. Temporary Electrical Facilities:
      a. General: Provide temporary electrical power and facilities necessary to supply lighting for work operations and power for power driven tools and testing.
      b. Construction Requirements:
         1. General: Construct and maintain temporary electrical facilities per requirements of the utility company providing service. Provide electrical materials, devices, and equipment that are in good and safe condition as follows:
         2. Division of Industrial Safety: "Electrical Safety Orders".
         3. Public Utilities Commission: "Rules for Overhead Line Construction".
      c. Electrical Service: Make application for temporary service from serving utility company and pay for electric service and energy used.
      d. Interior Lighting: Provide and maintain at a minimum level of two (2) watts per square foot, as required.
   3. Temporary Heat and Ventilation:
      a. General: Provide heat and ventilation as required to protect work and materials and reduce humidity to extent required to prevent corrosion of metal, dampness or mildew that may damage materials and finishes; fuel, equipment and method of heating and ventilating shall be acceptable to City.
      b. Finishing: Provide heat to produce temperature of not less than 70° F for seven (7) days prior to placement of interior finish materials and throughout period of installation of gypsum board, laying of resilient flooring materials, and painting.
      c. Acceptance: Maintain building temperature of not less than 60° F after finishing is complete and until final acceptance or occupancy by City.
   4. Telephone:
      a. General: Maintain telephone in field office for the use of the Contractor, and a separate telephone for the use of the City and Inspectors for duration of operations under this Contract. Provide and pay service charges for a cellular telephone and/or pager for use of Contractor's Superintendent.
      b. Availability: Provide access to telephone service for subcontractors and suppliers for duration of construction.
      c. Facsimile Machine (FAX): Provide acceptable telecopier device; provide access as necessary to expedite construction.
      d. Internet Access: Provide high-speed wireless internet access and e-mail capability at the job

site.

B. FIELD OFFICE:
   1. General: Provide acceptable construction trailer or temporary construction with floor raised above grade; waterproof, weathertight, and well lit and ventilated, including separate office space of sufficient size for City and Inspector. Equip with shelves, desks, filing cabinet, chairs, and such other items of equipment needed. Office and equipment is the property of the Contractor and must be removed from the site upon completion of work.
   2. Utilities: Provide electric lighting and power; make adequate provisions for heating and cooling.

C. SANITARY FACILITIES:
   1. Toilet Facilities: Provide enclosed chemical toilets with urinal for use of personnel engaged on Project.
   2. Drinking Water Facilities: Provide adequate clean and sanitary drinking water.

D. CONSTRUCTION EQUIPMENT:
   1. General: Erect, equip, operate, and maintain construction equipment per applicable statutes, laws, ordinances, rules, and regulations of jurisdictional authorities and insurance companies regarding safety, operation and fire hazard.
   2. Construction Access Equipment:
      a. General: Provide and maintain scaffolding, staging, runways, and similar equipment, as required. Coordinate furnishing and use with subcontractors.
      b. Vertical Transportation: Provide and maintain hoists per Safety Orders of State of California, Division of Industrial Safety, until work is completed or until no longer required under this Contract.

E. ENCLOSURES, FENCING AND BARRICADES:
   1. General: Provide and maintain barricades, fencing, shoring, pedestrian walkways including lights and other safety precautions to guard against personal injury and property damage as prescribed by jurisdictional authorities, including insurance companies.
   2. Safety Orders: Obtain copies and conduct work under the requirements of applicable Safety Orders issued by State of California, Division of Industrial Safety. Inform subcontractors and material suppliers as to the requirements of applicable Safety Orders.
   3. Contractor's Storage Area: Locate where shown; enclose with fences and gates as required for security.

F. TEMPORARY SIGNS:
   1. Project Sign: Refer to General Provisions.
   2. Other Signs: Not permitted; Contractor's name may be placed on field office and equipment.

G. SITE CONTROLS AND PARKING:
   1. Entrance to Work Site: Use identified entrances and access roads, as shown, or as directed. Maintain roads in satisfactory condition during Contract; repair damage resulting from work of this Project, as required, to leave in condition equal to that existing at start of Work.
   2. Site Storage and Work Areas: On-site storage and work areas will be identified by the City, for the Contractor's use, subject to change as necessary as job progresses.
   3. Regulations: Observe and comply with rules and regulations in effect at occupied facilities, including parking and traffic regulations, security restrictions, hours of access, and the like.
   4. Use of Public Sidewalks and Streets: Make arrangements with civic authorities for temporary use of streets and sidewalks for offices, shops, storage, etc.; abide by rules, regulations and ordinances; obtain and pay fees for permits.
   5. Debris Control: Keep work and storage areas clean and free of debris. Dispose of debris off site as it accumulates; pay required fees for use of dumps. Burning or burying on site is prohibited.
   6. Dust Controls:
      a. Indoor Operations: Control dust by using temporary partitions, curtains, or other means to prevent its spread beyond immediate work area. Use temporary means of closure for ducts and other openings communicating with other parts of building.
      b. Outdoor Operations: Use sprayed water to control dust from outdoor operations, as required.
   7. Noise Control: Minimize noise caused by work operations. To extent possible, schedule accomplishment of noisy construction operations to hours during which adjacent building occupants will be least inconvenienced.
   8. Dewatering Facilities: Provide and maintain pumping facilities to keep site reasonably dry; protect materials and installed work from water damage until dewatering is no longer required.
   9. Security: Contractor is responsible for security of areas of Work during entire time of Contract. Repair damage to Work and replace materials lost due to vandalism or theft.
   10. Drainage: As required by the State of California Water Resources Control Board, only rainwater is permitted in storm drain system. Do not permit water resulting from washing of equipment or other construction activities to be discharged into the storm drainage system. Provide temporary containment, sediment traps, and/or gravel filters to prevent discharge of non-storm water into storm drain system.

3. EXECUTION:

A. MAINTENANCE AND REMOVAL: Maintain temporary facilities and controls as long as required for safe and proper completion of Work; remove temporary facilities and controls as rapidly as progress of Work will permit.

* * *

PRODUCT REQUIREMENTS Section 01 60 00

1. GENERAL:

A. DESCRIPTION:
1. General: This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
2. Submittals: Product lists.
3. Quality Assurance: References, source limitations, compatibility of options and nameplates.
4. Product Options: Products specified by reference standards, specified products, alternate manufacturers, approved equals, and required products.
5. Product Handling: Procedures.

B. RELATED WORK:
1. General: The following items of Work are related to the Work of this Section but specified elsewhere in this Project Manual.
2. Alternates: Refer to Section 01 23 00 - ALTERNATES.
3. Closeout: Refer to Section 01 77 00 - CLOSEOUT PROCEDURES.

C. DEFINITIONS:
1. Products:
a. General: Items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
b. Named Products: Items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
2. Materials: Components shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. Equipment: Product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

D. SUBMITTALS:
1. General: Refer to Section 01 33 10 - SUBMITTALS.
2. Products List: Within thirty-five (35) days after award of contract, submit complete list of products intended for use on this Project. Provide list tabulated by Section Number, giving the trade name, name of the manufacturer, and model number or catalog designation of each product. Include products specified by reference standards and alternate products proposed for substitution (refer to General Provisions.)

E. QUALITY ASSURANCE:
1. General: Refer to Section 01 43 00 - QUALITY ASSURANCE.
2. Reference Standards: Refer to Section 01 42 00 - REFERENCES.
3. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
4. Compatibility of Options: When the Contractor is given the option of selecting between two (2) or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
5. Nameplates:
a. General: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.
b. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
c. Equipment: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces.

2. PRODUCTS:

A. GENERAL: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

B. PRODUCT OPTIONS:
1. General: For purposes of this Project products have been specified with the following options:
2. Products Specified by Reference Standards: Contractor may select any product which meets the standards, by any manufacturer.
3. Specified Products and Alternate Manufacturers: Wherever catalog numbers and specific brand or trade names are used in conjunction with a designated material, product, thing or service mentioned in these specifications, they are used to establish the standards of quality, utility and appearance required. The "specified product" shall be understood to be the basis for the project

design. Comparable products of named "alternate manufacturers" shall be considered equal in quality, utility and appearance. Contractor has the option of selecting from products and manufacturers named and must satisfy submittal requirements specified in Section 01 33 10 - SUBMITTALS.

4. Approved Equal: Where specification includes the designation "or approved equal", Contractor may request acceptance as "equal" any material, process, or product of unnamed manufacturer through use of the Substitution Request specified in Section 01 25 00 - SUBSTITUTION PROCEDURES. Requirements of that Section must be satisfied. Acceptance as "equal" will be the decision of the City; if the material, process or product is not, in the opinion of the City, equal in quality, utility and appearance to that specified, Contractor must furnish material, process or product specified.
5. Required Products: Where use of one named product and manufacturer is required to match others in use or because only one brand or trade name is known, there is no option, and no substitution will be allowed.

3. EXECUTION:

A. GENERAL: Refer to Section 01 73 10 - EXECUTION REQUIREMENTS.
B. PRODUCT HANDLING: Assure that Work is manufactured and/or fabricated in ample time so as to not delay construction progress. Transport, handle, store and protect products in accordance with manufacturer's instructions.

* * *

EXECUTION REQUIREMENTS Section 01 73 10

1. GENERAL:

A. DESCRIPTION: This Section includes administrative and procedural requirements governing the Contractor's installation of products specified for use in the Project.
B. SUBMITTALS:
   1. Closeout: Refer to Section 01 77 00 - CLOSEOUT PROCEDURES.
C. QUALITY ASSURANCE:
   1. General: Refer to Section 01 43 00 - QUALITY ASSURANCE.
   2. Reference Standards: Refer to Section 01 42 00 - REFERENCES.
   3. Qualifications: Use installers specialized in the work required, as specified in the individual sections of the Project Manual.

2. PRODUCTS:

A. GENERAL: Refer to Section 01 60 00 - PRODUCT REQUIREMENTS.
B. PRODUCT HANDLING:
   1. Delivery: Schedule delivery of materials to the site at such time as required for proper coordination of the work. Receive materials in manufacturer's unopened packages and bearing manufacturer's label.
   2. Storage: Store materials in a dry and well-ventilated place, adequately protected from damage and exposure to the elements.

3. EXECUTION:

A. PREPARATION:
   1. Construction Layout:
      a. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
      b. Verification: Before beginning to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If deviations are observed, promptly notify City.
      c. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
      d. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
      e. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by City.
   2. Examination of Conditions: Carefully examine sub-surfaces before beginning work; report to City any defects. Starting of work implies acceptance of conditions as they exist.
   3. Environmental Requirements: Verify that ambient temperature and moisture content are within limits of material and equipment manufacturers' instructions. Perform interior finish work only after building is closed and temperature can be maintained above 50 degrees F.
   4. Examination: Examine conditions of work in place before beginning work; report defects.
   5. Measurements:
      a. General: Take field measurements; report discrepancies between plan and field dimensions to City.
      b. Templates: Obtain templates, patterns, and setting instructions as required; verify dimensions.
   6. Protection: Provide temporary protection and enclosures for floor and roof openings, stairways, and similar conditions. Provide adequate temporary centering, bracing, and shoring for protection of structure during construction. Protect non-ferrous metal work throughout construction period; protect materials from damage during adjacent construction activities.
B. INSTALLATION:
   1. General: Install products in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Embedded Items: Coordinate delivery and placement of items embedded in work.
   3. Operating Equipment: Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate Work of various contractors having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

4. Mechanical and Electrical:
   a. General: Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
   b. Pipes, Ducts, Conduit, Fixtures and Outlets: In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
5. Completion:
   a. General: Coordinate completion and clean up of Work of various subcontractors in preparation for Substantial Completion and for portions of Work designated for City's occupancy.
   b. Correction of Defective Work: After City occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of City's activities.

* * *

CUTTING AND PATCHING Section 01 73 29

1. GENERAL:

A. DESCRIPTION: Provide all cutting, fitting and patching, including excavation and backfill as required per Section 31 20 10 - EARTHWORK, to complete the Work and to accomplish the applicable listed items.

B. LISTED ITEMS:
   1. Fitting: Make its several parts fit together properly.
   2. Untimely Work: Uncover portions of the Work to provide for installation of work not installed in the proper sequence of construction.
   3. Defective Work: Remove and replace defective and non-conforming work.
   4. Samples For Testing: Remove samples of installed work for testing per Section 01 45 23 - TESTING AND INSPECTION SERVICES and as identified in individual sections of the specifications.
   5. Mechanical and Electrical Penetrations: Provide penetrations of non-structural surfaces for installation of piping and conduit; refer to MECHANICAL and ELECTRICAL specifications.
   6. Existing Construction: Install specified work in existing Construction.

C. SUBMITTALS:
   1. Cutting and/or Alteration Request:
      a. General: Submit written request to the City in advance of executing any cutting or alteration to affected items as listed below.
      b. Affected Items: Work process of the City or any separate contractor; structural value or integrity of any element of the Project; integrity or effectiveness of weather-exposed or moisture-resistant elements or systems; efficiency, life, maintenance or safety of operational elements; visual qualities of sight-exposed elements.
      c. Request Requirements: Project name and location; description of all affected work; explanation of necessity for cutting, alteration or excavation; impact on the work of the City or any separate contractor, or on the structural or weatherproof integrity of the building; description of proposed work, including scope of cutting, patching, alteration, or excavation, products proposed to be used, trades who will complete the work, and extent of refinishing to be done; alternatives to cutting and patching; cost proposal, when applicable; written permission from any separate contractor whose work will be affected.
      d. Product Substitutions: Should conditions of Work or schedule indicate change of products from original installation, submit request for substitution as specified in Section 01 25 00 - SUBSTITUTION PROCEDURES.
      e. Field Observation: Submit written notice to City designating date and time work will be uncovered.

2. PRODUCTS:

A. MATERIALS: Comply with requirements of individual sections of these Specifications for replacement of Work removed and type of work to be done.

3. EXECUTION:

A. INSPECTION:
   1. General: Inspect existing conditions; include elements subject to damage or movement during cutting and patching.
   2. After Uncovering Work: Inspect conditions affecting the installation of products, or performance of Work.
   3. Unsatisfactory Conditions: Report unsatisfactory or questionable conditions to the City in writing; do not proceed with work until City has provided further instructions.

B. PREPARATION:
   1. Temporary Support: Provide as necessary to assure structural value or integrity of affected portion of Work.
   2. Protection:
      a. General: Provide devices and methods to protect other portions of the Project from damage.
      b. Environmental Protection: Provide protection from elements for that portion of the Project which may be exposed by cutting and patching, and maintain excavations free from water.

C. PERFORMANCE:
   1. Excavation and Backfill: Execute excavating and backfilling by methods which will prevent settlement or damage to other work per Section 31 20 10 - EARTHWORK.
   2. Cutting and Patching: Perform work with workers skilled in the trades involved. Make patches, seams and joints durable and inconspicuous.
   3. Adjustment: Execute fitting and adjustment of products to provide a finished installation complying with specified products, functions, tolerances and finishes.

4. Fitting: Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
5. Restoration: Restore work which has been cut or removed; install new products to provide completed Work as shown and specified.
6. Refinishing: Refinish entire surfaces as necessary to provide even finish to match adjacent finishes; refinish continuous surfaces to nearest intersection; entire unit of any assembly.

* * *

CONSTRUCTION WASTE MANAGEMENT Section 01 74 19

1. GENERAL:

A. DESCRIPTION: Provide Construction Waste Management including salvaging, recycling, and disposing of nonhazardous construction waste, as shown and specified per Contract Documents.

B. DEFINITIONS:

1. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
2. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
3. Debris: Non-hazardous solid material generated during the construction, demolition, or renovation of a structure and which exceed 2.5 inch particle size, that is, a manufactured object, plant or animal matter, or natural geologic material (e.g. cobbles and boulders).
4. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
5. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.
6. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
7. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
8. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

C. PERFORMANCE REQUIREMENTS:

1. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 50% minimum (75% one goal, over 75% big goal) by weight of total waste generated by the Work. City's goal is to salvage and recycle as much nonhazardous construction waste as possible including the following:
2. Construction Waste:
   a. Site-clearing waste.
   b. Masonry and CMU.
   c. Lumber.
   d. Wood sheet materials.
   e. Wood trim.
   f. Metals.
   g. Roofing.
   h. Insulation.
   i. Carpet and pad.
   j. Gypsum board.
   k. Piping.
   l. Electrical conduit.
3. Packaging: Salvage or recycle 100 percent of the following uncontaminated materials:
   a. Paper.
   b. Cardboard.
   c. Boxes.
   d. Plastic sheet and film.
   e. Polystyrene packaging.
   f. Wood crates.
   g. Plastic pails.

2. PRODUCTS:

A. SUBMITTALS:

1. General: Refer to Section 01 33 10 - SUBMITTALS and 01 33 29 - SUSTAINABLE DESIGN REPORTING.
2. Waste Management Plan:
   a. General: Submit 3 (three) copies of plan within 7 (seven) days of date commencement of the Work. Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume; use same units of measure throughout waste management plan.
   b. Waste Identification: Indicate anticipated types and quantities of construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

c. Waste Reduction Work Plan:
   1. General: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
   2. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
   3. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
   4. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
   5. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   6. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

d. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

e. Cost/Revenue Analysis:
   1. General: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
   2. Total quantity of waste.
   3. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
   4. Total cost of disposal (with no waste management).
   5. Revenue from salvaged materials.
   6. Revenue from recycled materials.
   7. Savings in hauling and tipping fees by donating materials.
   8. Savings in hauling and tipping fees that are avoided.
   9. Handling and transportation costs. Include cost of collection containers for each type of waste.
   10. Net additional cost or net savings from waste management plan.

f. Forms: Prepare waste management plan on forms included at end of Part 3.

3. Waste Reduction Progress Reports: Submit electronic copy (PDF) of report. Identify in submittal the material categories, generation point of the waste and total quantity of salvaged plus recycled waste recovered in .

4. Waste Reduction Calculations:
   a. General: Before request for Substantial Completion, submit 3 (three) copies of the following:
   b. Calculated end-of-Project Rates: Identify salvage, recycling, and disposal rates as a percentage of total waste generated.
   c. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
   d. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
   e. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
   f. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
   g. LEED Submittal: LEED letter template for Credit MR 2.1, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
   h. Qualification Data: For Waste Management Coordinator.

B. QUALITY REQUIREMENTS:
   1. General: Refer to Section 01 43 00 - QUALITY ASSURANCE.
   2. Reference Standards:
      a. General: Refer to Section 01 42 00 - REFERENCES for reference standards, applicable codes and definitions.
      b. American National Standards Institute (ANSI): ANSI 10.2 - Safety Code for Building Construction.
      c. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers standard specifications.
      d. California Occupational Safety and Health Administration (CalOSHA): Construction Safety

Orders; 29 CFR, PART 1926 Safety and Health Regulations for Construction.
e. California Integrated Waste Management Board: Sustainable Building Guidelines
f. U.S. Green Building Council (USGBC): LEED-BD+C Rating System.

3. Qualifications:
   a. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council.
   b. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
4. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
5. Waste Management Conference:
   a. General: Conduct conference at Project site to comply with requirements in Section 01 31 00 - PROJECT MANAGEMENT AND COORDINATION. Review methods and procedures related to waste management including, but not limited to, the following:
   b. Waste Management Coordinator: Review and discuss waste management plan including responsibilities.
   c. Quantities and Disposition: Review requirements for documenting quantities of each type of waste and its disposition.
   d. Material Separation: Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   e. Collection and Transportation: Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   f. Waste Management: Review requirements for each trade.

3. EXECUTION:

A. PERFORMANCE: Refer to Section 01 73 10 - EXECUTION REQUIREMENTS.
B. PREPARATION:
   1. General: Implement approved waste management plan;. Provide handling, containers, storage, signage, transportation, and other items as required; refer to Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.
   2. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management plan.
   3. Training: Train workers, subcontractors, and suppliers on proper waste management procedures. Review Waste Management Plan procedures and identify locations established for salvage, recycling, and disposal.
   4. Site Access and Temporary Controls: Conduct waste management operations with minimum interference with roads, streets, walks, walkways, and adjacent occupied facilities. Designate and label specific areas on the site for separating materials to be salvaged, recycled, reused, donated, and sold.
C. IMPLEMENTATION:
   1. Recycling:
      a. General: Proceeds, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
      b. Procedures:
         1. General: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
         2. Containers: Provide properly marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin. Inspect containers and bins for contamination and remove contaminated materials if found.
         3. Stockpiling: Collect and process materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust. Store materials away from construction area, off the ground and protect from the weather; do not store within drip line of remaining trees.
         4. Removal: Transport recyclable waste off City's property to recycling receiver or processor.
   2. Construction Waste:
      a. Packaging:
         1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
         2. Polystyrene Packaging: Separate and bag materials.
         3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. Pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
         4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

b. Site-Clearing Wastes: Chip brush, branches, and trees at landfill facility.
c. Wood:
   1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
   2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
d. Gypsum Board: Store large clean pieces in a dry location. Recycle off site.

3. Disposal:
   a. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   b. Burning and Burying of Materials: NOT ALLOWED.
   c. Disposal of Materials: Transport waste materials off City's property and legally dispose of them.

* * *

Project Name: Fire Station No. 5
Date: ____________________

Waste Diversion Tracking

Date	Material Type	Method of Diversion (Recycled/ Reused/ Donated)	Amount Landfilled (tons/cy)	Diverted Materials (tons/cy)

CLOSEOUT PROCEDURES Section 01 77 00

1. GENERAL:

A. DESCRIPTION: Perform operations necessary for and incidental to closing out the Contract and assisting in obtaining Project acceptance by the City.

B. FINAL CLEANING:
1. General: Remove marks, stains, fingerprints, dust, dirt, and paint drippings resulting from work of this Project. Wash tile, plumbing and other fixtures clean; polish hardware and other unpainted metals. Remove temporary labels, tags and paper covering.
2. Finish Surfaces: Perform specified cleaning, polishing, sealing, waxing, and other finish operations required for acceptance of work by the City.
3. Glass: Employ professional window cleaners to clean glass, mirrors and plastic surfaces of putty, paint materials, stains and dirt, as specified. Leave work bright, clean and polished.

C. CLOSEOUT SCHEDULE AND PROCEDURE:
1. Requirements Preparatory to Project Acceptance:
   a. Certifications: Deliver to City separate written certifications as required in Section 01 33 10 - SUBMITTALS stating that no materials containing asbestos has been installed in the Work, and that materials used in construction operations and installed in the Work comply with the volatile organic compound (VOC) requirements.
   b. Temporary Facilities: Remove from site per Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.
   c. Cleaning: Complete thorough building and site cleaning per Document 00 70 00 - GENERAL CONDITIONS, Article 1.2 of this Section, and the individual sections of the specifications.
   d. Adjustments:
      1. General: As required in the various technical sections of this Project Manual.
      2. Plumbing and Mechanical Equipment: Assure that equipment operates quietly and free from vibration. Properly adjust, repair, balance, or replace equipment producing objectionable noise or vibration in occupied areas of building; provide additional brackets, bracing, etc., to prevent such objectionable noise or vibration.
      3. Systems: Assure that all operate without humming, surging, or rapid cycling; balance reports are required before Mechanical Engineers will prepare "punch lists".
   e. Extra Stock: Deliver one (1) percent or a minimum of one full container of each kind and type of interior or unit finish material installed, unless otherwise specified. Package materials with protective covering and identify with labels describing contents.
   f. Affidavits: Submit affidavits of release of liens, payment of debts and claims and all applicable taxes.

2. PRODUCTS:

A. RECORD DRAWINGS:
1. General: Record drawings shall be kept up-to-date at all times. Verify that record drawings accurately show work completed to date before approval of pay requests.
2. Drawings:
   a. General: City will furnish required documents in reproducible medium to the Contractor.
   b. Locations: At time of installation, record installed locations of underground, drainage, plumbing and electrical work, including storm drain grate and invert elevations on prints.
   c. Documentation:
      1. General: Transfer installed locations to reproducible medium and submit documents to City.
      2. Identification of Changes: Information entered on reproducible documents shall be neat, legible and emphasized by drawing "clouds" around changed items.
      3. Dimensions: Locate work, including stubs for future connections, with reference to permanent landmarks or buildings and indicate depth below finish grade.
      4. Symbols and Designations: Use same as shown on Contract Drawings.
3. As-Built Survey: Prepared by Registered Land Surveyor in reproducible medium as required by Section 31 20 10 - EARTHWORK.
4. Certification: Completed Record Drawings shall be signed by Contractor as complete and accurate records of the Project, as built.

B. OPERATION AND MAINTENANCE INSTRUCTIONS:
1. General: Incorporate in Maintenance/Operating Manual(s), as specified below, brochures, manufacturer's catalogs and written instructions for equipment and materials needing regular care or maintenance; i.e., carpets, resilient flooring, architectural finishes, mechanical and electrical equipment, etc. Provide one (1) complete copy of each manual required and electronic copy (PDF) of contents.

2. Manual:
   a. General: Prepare manuals using durable plastic loose leaf binders approximately 8-1/2 x 11 inches in size with following minimum data:
   b. Identification: On, or readable through, a front cover stating general nature of manual.
   c. Index: Neatly typewritten at front of manual; **clearly identify location of emergency data.**
   d. Operation and Maintenance Data: Complete instructions for products and equipment required.
   e. Repair/Replacement Parts: Provide name and address of nearest vendor for replacement of parts or repair services.
   f. Additional Data: Where contents of manuals include manufacturer's catalog pages, clearly indicate precise items included in this installation and delete, or otherwise clearly indicate, manufacturer's data which is not in this installation.
3. Operating Instructions: Mount and post instructions for equipment, as required.
4. Service and Maintenance Contracts: As specified, executed by each subcontractor, manufacturer, and supplier as applicable.

C. GUARANTEES:
1. General: Provide in conformance with the requirements of Document 00 70 00 - GENERAL CONDITIONS and as required in the individual sections of this Project Manual.
2. Guarantee Period: Duration of the guarantees shall be as stated in the individual sections of this Project Manual. Guarantee periods shall commence on the official date of acceptance by the City of the Project.
3. Submittal: Submit required Guarantees on electronic copies (PDFs) of Guarantee Form included at the end of this Section and deliver in a complete package to the City.

3. EXECUTION:

A. PROJECT ACCEPTANCE:
1. General: Notify City when Contractor considers the Project complete enough to prepare a punch list. City will then notify Mechanical and Electrical Engineers to make inspections and prepare their punch lists, which must be completed before City will conduct inspection to determine if project is substantially complete in accordance with Construction Contract.
2. Notification: After requirements preparatory to project acceptance have been completed, Contractor shall notify City in writing that the Work is ready for final inspection; provide minimum three (3) days' advance notice of desired date for inspection.
3. Final Inspection: Contractor, or his agent authorized to act in his behalf, shall accompany the City on the final inspection, as well as any principal subcontractors requested by the City.

* * *

GUARANTEE FORM

Guarantee for _____

We hereby guarantee that the workmanship and materials that we installed in the Fire Station No. 5 have been in accordance with the Drawings and Project Manual and that the work as installed will fulfill the requirements of the guarantee included in the Project Manual. We agree to repair or replace any or all work, together with any other adjacent work that we may displace in so doing, that may prove to be defective in its workmanship or material within a period of _____ (____) years from date of acceptance by the City, without any expense whatsoever to City, ordinary wear and tear and unusual abuse or neglect excepted.

In the event of our failure to comply with the above-mentioned conditions within ten (10) days after being notified in writing by the City, we collectively or separately do hereby authorize City to proceed to have said defects repaired and made good at our expense and we will honor and pay the costs and charges therefor upon demand.

SUBCONTRACTOR:

_____
Signed Date

_____
Name Title

_____
Company Name License No.

_____
Address

GENERAL CONTRACTOR:

_____
Countersigned Date

_____
Name Title

_____
Company Name License No.

_____
Address

* * *

SUSTAINABLE DESIGN REQUIREMENTS Section 01 81 13

1. GENERAL:

A. SUMMARY:

1. General: Provide Sustainable Design Requirements, as shown and specified per Contract Documents. Meet the City of San Diego's Sustainable Buildings policy 900-14 and California Building Code (CBC), Green Building Standards Code (CALGreen): Title 24, Part 11.
2. Objectives:
   a. To obtain acceptable Indoor Air Quality (IAQ) for the completed project and minimize the environmental impacts of the construction and operation, the Contractor during the construction phase of this project shall implement the following procedures singly or in combination:
      1. Select products that minimize consumption of non-renewable resources, consume reduced amounts of energy and minimize amounts of pollution to produce, and employ recycled and/or recyclable materials. To help purchasers incorporate environmental considerations into purchasing decisions, it is the intent of this project to conform with EPA's Five Guiding Principles on environmentally preferable purchasing. The five principles are:
         a) Include environmental considerations as part of the normal purchasing process.
         b) Emphasize pollution prevention early in the purchasing process.
         c) Examine multiple environmental attributes throughout a product's or service's life cycle.
         d) Compare relevant environmental impacts when selecting products and services.
         e) Collect and base purchasing decisions on accurate and meaningful information about environmental performance.
      2. Control sources for potential IAQ pollutants by controlled selection of materials and processes used in project construction in order to attain superior IAQ.
      3. Products and processes that achieve the above objectives to the extent currently possible and practical have been selected and included in these Construction Documents. The Contractor is responsible to maintain and support these objectives in developing means and methods for performing the work of this Contract and in proposing product substitutions and/or changes to specified processes.
3. Related Work:
   a. General: The following items of Work are related to the Work of this Section but specified elsewhere in this Project Manual.
   b. Divisions 02 through 49: Sustainable Design Requirements specific to the Work of each identified Section.
   c. Waste Management: Refer to Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
   d. IAQ Testing: Refer to Section 01 81 19 - INDOOR AIR QUALITY TESTING.
   e. Commissioning: Refer to Section 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS.

B. REFERENCES:

1. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE): ASHRAE/IESNA Standard 90.1
2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
3. Business and Institutional Furniture Manufacturer's Association (BIFMA): Standard X7.1.
4. Carpet and Rug Institute (CRI): Green Label Plus Indoor Air Quality Test Program.
5. Collaborative for High Performance Schools (CHPS): Requirements.
6. Efficiency Valuation Organization (EVO): The International Performance Measurement and Verification Protocol.
7. Forest Stewardship Council (FSC): Principles and Criteria.
8. Greenguard Environmental Institute (GEI): Greenguard Children and Schools.
9. Illuminating Engineering Society of North America (IESNA):
   a. IESNA LM-9: Linear fluorescent lamps.
   b. IESNA LM-66: Compact fluorescent lamps.
   c. IESNA LM-51: HID lamps
10. National Institute of Standards and Technology (NIST): Building for Environmental and Economic Sustainability (BEES).
11. Rainforest Alliance (RA): Smartwood Certification Program.
12. Resilient Floor Covering Institute (RFCI): FloorScore Program.
13. Scientific Certification Systems (SCS): Standards and Certification.
14. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): IAQ Guidelines

for Occupied Buildings Under Construction.
15. South Coast Air Quality Management District (SCAQMD): Rule 1113 - Architectural Coatings.
16. U.S. Environmental Protection Agency (USEPA):
    a. General: Energy Star Program.
    b. Legislation: Energy Policy Act (EPAct) of 1992 and Energy Policy Act of 2005.
    c. Volatile Organic Compounds: EPA 40 CFR 51.100(s) - Volatile Organic Compounds (VOCs).
17. U.S. Green Building Council (USGBC): LEED: BD+C Building Design and Construction Rating System.
18. U.S. Federal Trade Commission (FTC): FTC Act, Part 260 - Guidelines for the Use of Environmental Marketing Claims.

C. DEFINITIONS:
1. Agrifiber Products: Composite panel products derived from agricultural fiber.
2. Biobased Product: As defined in the 2002 Farm Bill, a product determined by the Secretary to be a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials.
3. Biobased Content: The weight of the biobased material divided by the total weight of the product and expressed as a percentage by weight.
4. Certificates of Chain-of-Custody: Certificates signed by manufacturers certifying that wood used to make products has been tracked through its extraction and fabrication to ensure that it was obtained from forests certified by a specified certification program.
5. Composite Wood: A product consisting of wood fiber or other plant particles bonded together by a resin or binder.
6. Construction and Demolition Waste: Includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair and demolition operations. A construction waste management plan is to be provided by the Contractor as defined in Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
7. LEED: The Leadership in Energy & Environmental Design green building rating systems developed and adopted by the U.S. Green Building Council (USGBC). The systems certify levels of environmental achievement based on a point and credit scoring system.
8. LEED BD+C: The Leadership in Energy & Environmental Design green building rating system developed and adopted by the USGBC for new construction and major renovations of buildings.
9. Light Pollution: Light that extends beyond its source such that the additional light is wasted in an unwanted area or in an area where it inhibits view of the night sky.
10. Recycled Content Materials: Products that contain pre-consumer or post-consumer materials as or part of their feedstock.
11. Post-Consumer Recycled Content: The percentage by weight of constituent materials that have been recovered or otherwise diverted from the solid-waste stream after consumer use.
12. Pre-Consumer Recycled Content: Materials that have been recovered or otherwise diverted from the solid-waste stream during the manufacturing process. Pre-consumer content must be material that would not have otherwise entered the waste stream per Section 5 of the FTC Act, Part 260 - Guidelines for the Use of Environmental Marketing Claims.
13. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 500 miles from the Project site.
14. Salvaged or Reused Materials: Materials extracted from existing buildings in order to be reused in other buildings without being manufactured.
15. Sealant: Any material that fills and seals gaps between other materials.
16. Volatile Organic Compounds (VOCs): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. Compounds that have negligible photochemical reactivity, listed in EPA 40 CFR 51.100(s), are also excluded from this regulatory definition.

D. SUBMITTALS:
1. General: Additional Sustainable Design submittal requirements are included in other sections of the Specifications.
    a. Sustainable Design Submittals:
        1. Alternative Transportation: Provide manufacturer's cut sheets for bike racks installed on site, including the total number of bicycle storage slots provided. Also, provide manufacturer's cut sheets for any alternative-fuel refueling stations installed on site, including fueling capacity information for an 8-hour period.
        2. Heat Island Effect:
            a) Site Paving: Provide manufacturer's cut sheets for impervious paving materials, highlighting the Solar Reflectance Index (SRI) of the material. Also, provide cut sheets for pervious paving materials.
            b) Roofing Materials: Submittals for roofing materials must include manufacturer's cut

sheets or product data highlighting the Solar Reflectance Index (SRI) of the material.

3. Exterior Lighting Fixtures: Submittals must include cut sheets with manufacturer's data on initial fixture lumens above 90° from nadir for exterior lighting fixtures, and, for parking lot lighting, verification that the fixtures are classified by the IESNA as "full cutoff" (FCO); OR provide documentation that exterior luminaires are IDA-Approved as Dark-Sky Friendly by the International Dark Sky Association (IDA) Fixture Seal of Approval Program.
4. Irrigation Systems: Provide manufacturer's cut sheets for permanent landscape irrigation system components and for any rainwater harvesting system components, such as cisterns.
5. Water Conserving Fixtures: Submittals must include manufacturer's cut sheets for water-consuming plumbing fixtures and fittings (toilets, urinals, faucets, showerheads, etc.) highlighting maximum flow rates and/or flush rates. Include cut sheets for any automatic faucet-control devices.
6. Process Water Use: Provide manufacturer's cut sheets for water-consuming commercial equipment (clothes washers, dishwashers, ice machines, etc.), highlighting water consumption performance. Include manufacturer's cut sheets or product data for any cooling towers, highlighting water consumption estimates, water use reduction measures, and corrosion inhibitors.
7. Elimination of CFCs AND HCFCs: Provide manufacturer's cut sheets for cooling equipment with manufacturer's product data, highlighting refrigerants; provide manufacturer's cut sheets for fire-suppression equipment, highlighting fire-suppression agents; provide manufacturer's cut-sheets for polystyrene insulation (XPS) and closed-cell spray foam polyurethane insulation, highlighting the blowing agent(s).
8. Appliances and Equipment: Provide copies of manufacturer's product data for Energy Star eligible equipment and appliances, including office equipment, computers and printers, electronics, and commercial food service equipment (excluding HVAC and lighting components), verifying compliance with EPA's Energy Star program.
9. On-Site Renewable Energy Systems: Provide cut sheets and manufacturer's product data for on-site renewable energy generating components and equipment, including documentation of output capacity.
10. Measurement and Verification Systems: Provide cut sheets and manufacturer's product data for controls systems, highlighting electrical metering and trending capability components.
11. Salvaged or Reused Materials: Provide documentation that lists each salvaged or reused material, the source or vendor of the material, the purchase price, and the replacement cost if greater than the purchase price.
12. Recycled Content: Submittals for materials with recycled content (excluding MEP systems equipment and components) must include the following documentation:
    a) Cost of each material or product, excluding cost of labor and equipment for installation.
    b) Manufacturer's product data, product literature, or a letter from the manufacturer verifying the percentage of post-consumer and pre-consumer recycled content (by weight) of each material or product.
    c) An electronic spreadsheet that tabulates the Project's total materials cost and combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value) expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate, on an ongoing basis, line items for each material, including cost, pre-consumer recycled content, post-consumer recycled content, and combined recycled content value.
13. Regional Materials: Submittals for products or materials expected to contribute to the regional calculation (excluding MEP systems equipment and components) must include the following documentation:
    a) Cost of each material or product, excluding cost of labor and equipment for installation.
    b) Location of product manufacture and distance from point of manufacture to the Project Site.
    c) Location of point of extraction, harvest, or recovery for each raw material in each product and distance from the point of extraction, harvest, or recovery to the Project Site.
    d) Manufacturer's product data, product literature, or a letter from the manufacturer verifying the location and distance from the Project Site to the point of manufacture for each regional material.
    e) Manufacturer's product data, product literature, or a letter from the manufacturer

verifying the location and distance from the Project Site to the point of extraction, harvest, or recovery for each regional material or product, including, at a minimum, gravel and fill, planting materials, concrete, masonry, and gypsum board.

f) An electronic spreadsheet that tabulates the Project's total materials cost and regional materials value, expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate on an ongoing basis, line items for each material, including cost, location of manufacture, distance from manufacturing plant to the Project Site, location of raw material extraction, and distance from extraction point to the Project Site.

14. Biobased Products:
    a) Certified Wood: Submittals for wood-based materials must include a statement indicating the cost of each product containing FSC Certified wood, exclusive of labor and delivery costs, and certificates of chain-of-custody from manufacturers certifying that specified certified-wood products were made from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2 "Principles and Criteria."
15. Outdoor Air Delivery Monitoring: Provide manufacturer's cut sheets highlighting the installed carbon dioxide monitoring system components and sequence of controls shop drawing documentation, including CO_2 differential set-points and alarm capabilities.
16. Interior Adhesives and Sealants: Submittals for field-applied adhesives and sealants, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content.
    a) Provide manufacturers' documentation verifying adhesives used to apply laminates, whether shop-applied or field-applied, contain no urea-formaldehyde.
17. Interior Paints and Coatings: Submittals for field-applied paints and coatings, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content.
18. Exterior Paints and Coatings: Submittals for field-applied paints and coatings, which have a potential impact on ambient air quality, must include manufacturer's MSDSs or other manufacturer's Product Data highlighting VOC content.
19. Floorcoverings:
    a) Carpet Systems: Submittals for carpet must include the following:
        1) A copy of an assessment from the Building for Environmental and Economic Sustainability (BEES) software model, either Version 3.0 or 4.0, with parameters of the model set as described by this specification section.
        2) Manufacturer's product data verifying that carpet systems meet or exceed the testing and product requirements of the Carpet and Rug Institute Green Label Plus program.
    b) Resilient Flooring: Submittals for resilient floorcovering must include manufacturer's product data verifying certification under either the Greenguard for Children & Schools or FloorScore indoor emissions testing program.
    c) Engineered Wood Flooring and Bamboo Flooring: Submittals for engineered wood flooring and bamboo flooring must include manufacturer's product data verifying certification under either the Greenguard or FloorScore indoor emissions testing program.
20. Composite Wood and Agrifiber Binders: Submittals for composite wood and agrifiber products (including but not limited to particleboard, wheatboard, strawboard, agriboard products, engineered wood components, solid-core wood doors, OSB, MDF, and plywood products) must include manufacturer's product data verifying that these products contain no urea-formaldehyde resins.
21. Systems Furniture and Seating: Provide manufacturer's product data verifying that systems furniture and seating products meet the requirements of one of the following:
    a) Greenguard certification.
    b) SCS Indoor Advantage certification.
    c) SCS Indoor Advantage Gold certification.
    d) BIFMA Standard X7.1-2005, as tested to BIFMA method M7.1-2005 and as verified by an independent laboratory.
    e) Calculated indoor air concentration limits for furniture systems and seating determined by the U.S. EPA's Environmental Technology Verification Large Chamber Test Protocol for Measuring Emissions of VOCs and Aldehydes (September 1999) testing protocol as conducted in an independent air quality testing laboratory.
22. Entryway Systems: Provide manufacturer's cut sheets for walk-off systems installed to capture particulates, including permanently installed grates, grilles, slotted systems, direct glue-down walk-off mats, and non-permanent roll-out mats.

23. Air Filtration: Provide manufacturer's cut sheets and product data highlighting the following:
    a) Minimum Efficiency Reporting Value (MERV) for filtration media in air handling units (AHUs).
    b) Minimum Efficiency Reporting Value (MERV) for filtration media installed at return air grilles during construction if permanently installed AHUs are used during construction.
24. Mercury in Lighting: Provide manufacturer's cut sheets or product data for fluorescent or HID lamps highlighting mercury content.
25. Lighting Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting lighting controls systems components.
26. Thermal Comfort Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting thermal comfort-control systems components.
27. Blended Cement: It is the intent of this specification to reduce CO_2 emissions and other environmentally detrimental effects resulting from the production of portland cement by requiring that concrete mixes, in aggregate, utilize blended cement mixes to displace 40% of the portland cement typically included in conventional construction. Provide the following submittals:
    a) Copies of concrete design mixes for installed concrete.
    b) Copies of typical regional baseline concrete design mixes for compressive strengths used on the Project.
    c) Quantities in cubic yards of each installed concrete mix.
28. Gypsum Board: Provide manufacturer's cut sheets or product data verifying that gypsum board products are moisture and mold-resistant.
29. Fiberglass Insulation: Provide manufacturer's cut sheets or product data verifying that fiberglass batt insulation contains no urea-formaldehyde.
30. Duct Acoustical Insulation: Provide manufacturer's cut sheets or product data verifying that mechanical sound insulation materials in air distribution ducts consist of impervious, non-porous coatings that prevent dust from accumulating in the insulating materials.
31. Green Housekeeping: Provide documentation that cleaning products and janitorial paper products meet the VOC limits and content requirements of this specification section.

b. Project Materials Cost Data: Provide a spreadsheet in an electronic file indicating the total cost for the Project and the total cost of building materials used for the Project, as follows:
    1. Not more than 60 days after the Preconstruction Meeting, the General Contractor shall provide to the City a preliminary schedule of materials costs for materials used for the Project organized by specification section. Exclude labor costs and mechanical, electrical, and plumbing (MEP) systems materials and labor costs. Include the following:
        a) Identify each recycled-content material, its post-consumer and pre-consumer recycled content as a percentage the product's weight, its cost, its combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value), and the total combined recycled content value for materials as a percentage of total materials costs.
        b) Identify each regional material, its cost, its manufacturing location, the distance of this location from the Project site, the source location for each raw material component of the material, the distance of these extraction locations from the Project site, and the total value of regional materials as a percentage of total materials costs.
        c) Identify each wood-based material, its cost, the total wood-based materials cost, each FSC Certified wood material, its cost, and the total value of FSC Certified wood as a percentage of total wood-based materials costs.
        d) Provide final versions of the above spreadsheets to the City not more than 14 days after Substantial Completion.
    2. Construction Waste Management: Refer to Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT for submittal requirements.
    3. Construction Indoor Air Quality (IAQ) Management: Submittals must include the following:
        a) Not more than 30 days after the Preconstruction Meeting, prepare and submit for the City approval, an electronic copy of the draft Construction IAQ Management Plan in an electronic file including, but not limited to, descriptions of the following:
            1) Construction procedures for meeting or exceeding the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, Chapter 3, including procedures for HVAC Protection, Source Control, Pathway Interruption, Housekeeping, and Scheduling.
            2) Construction procedures for protecting absorptive materials stored on-site or

installed from moisture damage.
3) Schedule of submission to City of photographs of on-site construction IAQ management measures such as protection of ducts and on-site stored oil and installed absorptive materials.
4) Construction procedures if air handlers must be used during construction, including a description of filtration media to be used at each return air grille.
5) Construction procedure for replacing air-filtration media immediately prior to occupancy after completion of construction, including a description of filtration media to be used at each air handling or air supply unit.

b) Not more than 30 days following receipt of the approved draft CIAQMP, submit an electronic copy of the approved CIAQMP in an electronic file, along with the following:
1) Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for filtration media to be installed at return air grilles during construction if permanently installed AHUs are used during construction.
2) Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for filtration media in air handling units (AHUs).

c) Not more than 14 days after Substantial Completion provide the following:
1) Documentation verifying required replacement of air filtration media in air handling units (AHUs) after the completion of construction and prior to occupancy and, if applicable, required installation of filtration during construction.
2) A minimum of 18 Construction photographs: Six photographs taken on three different occasions during construction of the SMACNA approaches employed, along with a brief description of each approach, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.

d) A copy of the report from testing and inspecting agency documenting the results of IAQ testing, demonstrating conformance with IAQ testing procedures and requirements defined in Section 01 81 19 - INDOOR AIR QUALITY TESTING.

4. Commissioning: See Section 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS for submittal requirements.
5. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports for the following:
a) Construction Waste Management: Waste reduction progress reports and logs complying with the requirements of Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
b) Construction IAQ Management: See details below under Paragraph 3.B Construction Indoor Air Quality Management for Construction IAQ management progress report requirements.

E. QUALITY ASSURANCE:
1. Preconstruction Meeting: After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with City and Subcontractors to discuss the Construction Waste Management Plan, the required Construction Indoor Air Quality (IAQ) Management Plan, and other Sustainable Design Requirements. The purpose of this meeting is to develop a mutual understanding of the Project's Sustainable Design Requirements and coordination of the Contractor's management of these requirements with the Contracting Officer and the Construction Quality Manager.
2. Construction Job Conferences: The status of compliance with the Sustainable Design Requirements of these specifications will be an agenda item at regular job meetings conducted during the course of work at the site.

2. PRODUCTS:

A. PRODUCT ENVIRONMENTAL REQUIREMENTS:
1. Site Clearing: Topsoil shall be provided by the Contractor from on-site material which has been stockpiled for reuse. Off-site borrow should only be used when on-site sources are exhausted. Chip and/or compost on site vegetated material identified for removal.
2. Do not burn rubbish, organic matter, etc. or any material on the site. Dispose of waste per Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
3. Roofing Materials: Roofing systems, other than vegetated roof systems, must comply with the following requirements:
a. Low-Sloped roofing less than or equal to 2:12 slope must have an SRI of at least 78.
b. Steep-Sloped roofing greater than 2:12 slope must have an SRI of at least 29.
4. Irrigation Systems: Any permanent landscape irrigation systems must be comprised of below-grade drip emitters controlled by moisture sensors. Timer controls shall not be permitted.

5. Water-Conserving Fixtures: Plumbing fixtures and fittings shall use in aggregate at least 40% less water than the water use baseline calculated for the building after meeting the Energy Policy Act of 1992 fixture performance requirements. Flow and flush rates shall not exceed the following:
   a. Toilets: No more than 1.3 gallons per flush, otherwise be dual flush 1.6/0.8 gallons per flush, and have documented bowl evacuation capability per MaP testing of at least 400 grams.
   b. Urinals: No more than 0.125 gallons per flush or use.
   c. Lavatory Faucets: 0.5 gpm with automatic faucet controls.
   d. Kitchen Sink Lavatories: 2.2 gpm.
   e. Showerheads: No more than 1.5 gpm.
6. Process Water Use: Employ strategies that in aggregate result in 20% less water use than the process water use baseline for the building after meeting the commercial equipment and HVAC performance requirements as listed in the Table below. For equipment not addressed by Energy Policy Act of 2005 or the list below, additional equipment performance requirements may be proposed provided documentation supporting the proposed benchmark or industry standard is submitted.
   a. Clothes Washer: 7.5 gallons/cubic foot/cycle.
   b. Dishwasher with Racks: 1.0 gallons/rack.
   c. Ice Machine: 20 gallons/100 pounds ice for machines making over 175 pounds of ice per day; 30 gallons/100 pounds ice for machines making less than 175 ice per day. Avoid water-cooled machines.
   d. Food Steamer: 2 gallons/hour. Use only boilerless steamers.
   e. Pre-Rinse Spray Valves: 1.4 gallons/minute.
   f. Kitchen Pot-Washing Sinks: 2.2 gallons/minute.
   g. Cooling Towers: 2.3 gallons/ton-hr. water loss.
      1. Use atrazine-based corrosion inhibitors and reducing bleed-off by increasing cycles of concentration (at least 5, or with water quality problems limit to 4).
      2. Install meters on make-up water and discharge blow-down.
      3. Install conductivity controller for blow-down.
      4. Provide overflow alarm connected to central building controls.
      5. Install drift eliminators.
      6. Provide makeup water from sources other than potable water supply.
7. Elimination of CFCs AND HCFCs:
   a. Ozone Protection: Base building cooling equipment shall contain no refrigerants other than the following: HCFC-123, HFC-134a, HFC-245fa, HFC-407c, or HFC 410a.
   b. Fire suppression systems may not contain ozone-depleting substances.
   c. Extruded polystyrene insulation (XPS) and closed-cell spray foam polyurethane insulation shall not be manufactured with hydrochlorofluorocarbon (HCFC) blowing agents.
8. Appliances and Equipment: Energy Star eligible equipment and appliances, including office equipment, computers and printers, electronics, and commercial food service equipment (excluding HVAC and lighting components), shall be qualified by EPA's Energy Star Program.
9. HVAC Distribution Efficiency:
   a. Duct systems shall be constructed of galvanized sheet metal, aluminum, or stainless steel as deemed appropriate based on the application requirements. No fiberglass duct board shall be permitted.
   b. Medium- and high-pressure ductwork systems shall be pressure-tested in accordance with the current SMACNA standards.
   c. All ductwork shall be externally insulated. No interior duct liner shall be permitted.
   d. Where possible, air terminal connections shall be hard-connected with sheet metal ductwork. If flexible ductwork is used, no flexible duct extension shall be more than six feet in length.
   e. HVAC equipment shall be isolated from the ductwork system with flexible duct connectors to minimize the transmittance of vibration.
   f. Supply and return air branch ducts shall include the appropriate style of volume damper. Air terminal devices such as grilles, registers, and diffusers shall be balanced at duct branch dampers, not at terminal face.
10. Recycled Content of Materials:
    a. Provide building materials with recycled content such that post-consumer recycled content value plus half the pre-consumer recycled content value constitutes a minimum of 30% of the cost of materials used for the Project, exclusive of MEP equipment, labor, and delivery costs. The Contractor shall make attempts to maximize the procurement of materials with recycled content.
       1. The post-consumer recycled content value of a material shall be determined by dividing the weight of post-consumer recycled content by the total weight of the material and multiplying by the cost of the material.
       2. The pre-consumer recycled content value of a material shall be determined by dividing the weight of pre-consumer recycled content by the total weight of the material and

multiplying by the cost of the material.

3. Do not include mechanical and electrical components in the calculations.
4. Do not include labor and delivery costs in the calculations.
5. Recycled content of materials shall be defined according to the Federal Trade Commission's "FTC Act, Part 260 - Guidelines for the Use of Environmental Marketing Claims," 16 CFR 260.7 (e).
6. Utilize on-site existing paving materials that are scheduled for demolition as granulated fill, and include the cost of this material had it been purchased in the calculations for recycled content value.
7. At a minimum, the materials in the following list must contain the minimum recycled content indicated:

(a) Compost/mulch	100% post-consumer
(b) Asphaltic Concrete Paving	25% post-consumer
(c) Cast-in-Place Concrete	6% pre-consumer
(d) CMU Gray Block	20% pre-consumer
(e) Steel Reinforcing Bars	90% combined
(f) Structural Steel Shapes	90% combined
(g) Steel Joists	75% combined
(h) Steel Deck	75% combined
(i) Steel Fabrications	60% combined
(j) Steel Studs	30% combined
(k) Steel Roofing	30% post-consumer
(l) Aluminum Fabrications	35% combined
(m) Rigid Insulation	20% pre-consumer
(n) Batt insulation	30% combined
(o) Cellulose Insulation	90% combined
(p) Rock Wool Insulation	75% pre-consumer
(q) Fireproofing	20% combined
(r) Steel Doors and Frames	35% combined
(s) Gypsum Board	100% combined
(t) Carpet	40% combined
(u) Ceramic Tile Flooring	60% combined
(v) Rubber Flooring and Base	60% combined
(w) Acoustical Ceiling Tile (ACT)	40% post-consumer
(x) ACT Suspension System	90% post-consumer
(y) Toilet Partitions	60% post-consumer

11. Regional Materials: Provide a minimum of 10 percent minimum (20 percent goal) of building materials (by cost) that are manufactured and extracted/harvested within a 500-mile radius of the project site, exclusive of labor and delivery costs. The Contractor shall make attempts to maximize the procurement of materials within this specified 500-mile radius.
12. Biobased Products:
    a. Solid Wood Products: New solid-wood-based materials will be certified as "FSC 100%" by an independent third party in accordance with Forest Stewardship Council (FSC) "Principles and Criteria" and will have received Chain-of-Custody Certification as certified by an accredited certification group such as Rainforest Alliance (RA) (Smartwood) or Scientific Certification Systems (SCS).
    b. Other Wood Products: Other new wood-based materials will be certified by an independent third party in accordance with any of the following standards:
        1. Forest Stewardship Council (FSC) "Principles and Criteria" and has received Chain-of-Custody Certification as certified by an accredited certification group such as Rainforest Alliance (RA) (Smartwood) or Scientific Certification Systems (SCS).
    c. Preservative-treated lumber with chromated copper arsenate (CCA) treatments is not permitted, and lumber with copper-based treatments (such as ACQ) is permitted only for ground-contact applications.
    d. Wood-based materials include but are not limited to the following materials (when made from wood), engineered wood products, or wood-based panel products:
        1. Rough carpentry.
        2. Miscellaneous carpentry.
        3. Heavy timber construction.
        4. Wood decking.
        5. Particleboard.
        6. Plywood.
        7. Metal-plate-connected wood trusses.
        8. Structural glued-laminated timber.
        9. Finish carpentry.
        10. Architectural woodwork.

11. Wood paneling.
12. Wood veneer wall covering.
13. Wood flooring.
14. Wood lockers.
15. Wood cabinets.
16. Wood doors.
17. Non-rented temporary construction, including bracing, concrete formwork, pedestrian barriers, and temporary protection.

13. Brominated Flame Retardants: For new furniture, do not utilize cushioned office seating, and for lounge seating, do not utilize cushioned seating with brominated flame retardants.
14. Outdoor Air Delivery Monitoring:
    a. Spaces with an occupant density greater than 1 person per 40 square feet must include at least one CO_2 monitor located between 3 feet and 6 feet above the finished floor.
    b. Spaces with occupant density less than 1 person per 40 square feet must include a direct outdoor airflow monitor, capable of measuring the minimum outdoor airflow rate within 15% accuracy.
    c. Monitoring equipment must be configured to generate a building automation system alarm and a visual or audible alert when CO_2 concentrations vary by 10% or more from set point.
15. Adhesives and Sealants:
    a. Adhesives and sealants used inside the building's thermal envelope must be third-party certified under one of the following programs:
        1. Indoor Advantage Plus from Scientific Certification Systems (SCS).
        2. Greenguard Environmental Institute (GEI) Greenguard Children and Schools.
        3. Collaborative for High Performance Schools (CHPS).
    b. Adhesives and sealants, regardless of where they are used, must comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24):
        1. Concrete Curing Compound: 60 g/L.
        2. Concrete Sealer: 10 g/L.
        3. Concrete Form Release Agents: 0g/L.
        4. Garage Deck Sealer: 50g/L.
        5. Wood Glues: 20 g/L.
        6. Millwork and Casework Adhesives: 20g/L.
        7. Metal to Metal Adhesives: 30 g/L.
        8. Adhesives for Porous Materials (Except Wood): 50 g/L.
        9. Subfloor Adhesives: 50 g/L.
        10. Plastic Foam Adhesives: 50 g/L.
        11. Carpet Adhesives: 50 g/L.
        12. Carpet Pad Adhesives: 50 g/L.
        13. Carpet Seam Sealer: 50g/L.
        14. VCT and Sheet Vinyl Adhesives: 50 g/L.
        15. Cove Base Adhesives: 50 g/L.
        16. Rubber Floor Adhesives: 60 g/L.
        17. Wood Flooring Adhesives: 100 g/L.
        18. Ceramic Tile Adhesives: 65 g/L.
        19. Gypsum Board and Panel Adhesives: 50 g/L.
        20. Gypsum Drywall Joint Compound: 20 g/L.
        21. Portland Cement Plaster: 20 g/L.
        22. Multipurpose Construction Adhesives: 70 g/L.
        23. Cast Resin Countertop Silicone Sealant: 20g/L.
        24. Plastic Laminate Adhesives: 20 g/L.
        25. General Contact Adhesive: 80 g/L.
        26. Structural Glazing Adhesives and Compounds: 100 g/L.
        27. Silicone Sealant: 50 g/L.
        28. Pipe Thread Sealant: 50 g/L.
        29. Duct Sealant: 10 g/L.
        30. Plastic Cement Welding Compounds: 250 g/L.
        31. ABS Welding Compounds: 400 g/L.
        32. CPVC Welding Compounds: 270 g/L.
        33. PVC Welding Compounds: 150 g/L.
        34. Adhesive Primer for Plastic: 250 g/L.
        35. Architectural Sealants: 250 g/L.
        36. Single-Ply Roofing Membrane Adhesives: 250 g/L.
    c. Interior sealants shall not contain: mercury, butyl rubber, neoprene, SBR (styrene butadi-ene rubber), or nitrile.
    d. Sealants and glazing compounds formulated with aromatic solvents (organic solvent with a benzene ring in its molecular structure) fibrous talc or asbestos, formaldehyde, halo-genated

solvents, mercury, lead, cadmium, hexavalent chromium, or their components shall not be used.

e. Adhesives used to apply laminates, whether shop-applied or field-applied, shall contain no urea-formaldehyde.

16. Paints and Coatings:
    a. Interior Paints and Coatings: For interior field-applied applications, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the chemical restrictions (Restricted Components listed below) of Green Seal Standard GS-11, Paints; Green Seal Standard GC-03, Anti-Corrosive Paints; and South Coast Air Quality Management District Rule 1113, Architectural Coatings, rules in effect on January 1, 2004, as follows:
        1. Flat Paints and Coatings: Not more than 10 grams of VOC per liter of coating less water and exempt compounds, including pigments.
        2. Non-Flat Paints and Coatings Except High Gloss: Not more than 50 grams of VOC per liter of coating less water and exempt compounds, including pigments.
        3. High Gloss Paints and Coatings: Not more than 150 grams of VOC per liter of coating less water and exempt compounds, including pigments. High Gloss Coatings are coatings that register a gloss of 70 or above on a 60-degree meter according to ASTM D523 as specified in paragraph (e)(6).
        4. Water-Based Polychromatic Finish Coatings: Not more than 150 g/L (150 g/L for primer and flat polychromatic paint).
        5. Anti-Corrosive Coatings: Not more than 100 grams of VOC per liter of coating less water and exempt compounds.
        6. Sanding Sealers: Not more than 50 grams of VOC per liter of coating less water and exempt compounds.
        7. Waterproofing Sealers: Not more than 100 grams of VOC per liter of coating less water and exempt compounds.
        8. Concrete Slab Sealers: Not more than 10 grams of VOC per liter of coating less water and exempt compounds.
        9. Polyurethanes: Not more than 100 grams of VOC per liter of coating less water and exempt compounds.
        10. Stains: Not more than 250 grams of VOC per liter of coating less water and exempt compounds.
    b. Interior field applied varnishes and lacquers are not permitted.
    c. Interior paints shall not contain antimicrobial additives (such as fungicides and biocides).
    d. Exterior Paints and Coatings: For exterior applications, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the chemical restrictions (Restricted Components listed below) of Green Seal Standard GS-11:
        1. Flat Paints and Coatings: Not more than 50 grams of VOC per liter of coating less water and exempt compounds, including pigments.
        2. Non-Flat Paints and Coatings: Not more than 150 grams of VOC per liter of coating less water and exempt compounds, including pigments.
        3. High Gloss Paints and Coatings: Not more than 150 grams of VOC per liter of coating less water and exempt compounds, including pigments. High Gloss Coatings are coatings that register a gloss of 70 or above on a 60-degree meter according to ASTM D523 as specified in paragraph (e)(6).
        4. Anti-Corrosive Coatings: Not more than 100 grams of VOC per liter of coating less water and exempt compounds.
        5. Varnishes and Sanding Sealers: Not more than 275 grams of VOC per liter of coating less water and exempt compounds.
        6. Stains: Not more than 250 grams of VOC per liter of coating less water and exempt compounds.
    e. Aromatic Compounds: Paints and coatings shall not contain more than 1% (by weight) total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
    f. Restricted Components: Paints and coatings shall not contain the following:
        1. Acrolein.
        2. Acrylonitrile.
        3. Analine dyes.
        4. Antimony.
        5. Benzene.
        6. Butyl benzyl phthalate.
        7. Cadmium.
        8. Di (2-ethylhexyl) phthalate.
        9. Di-n-butyl phthalate.
        10. Di-n-octyl phthalate.

11. 1,2-dichlorobenzene.
12. Diethyl phthalate.
13. Dimethyl phthalate.
14. Ethylbenzene.
15. Formaldehyde.
16. Hexavalent chromium.
17. Isophorone.
18. Lead.
19. Mercury.
20. Methyl ethyl ketone.
21. Methyl isobutyl ketone.
22. Methylene chloride.
23. Naphthalene.
24. Toluene (methylbenzene).
25. 1,1,1-trichloroethane.
26. Vinyl chloride.
27. Xylene.

g. Coordinate with paint manufacturers for implementing a "take-back program" for unused paint. Set aside scrap and unused paint to be returned to the manufacturer for recycling into new product. Close and seal partially used containers of paint to maintain quality as necessary for reuse.

17. Floorcoverings:
    a. Carpet shall achieve an Environmental Performance Score of 0.0200 as determined through an assessment in the NIST Building for Environmental and Economic Sustainability (BEES) software model, either Version 3.0 or 4.0. The parameters of the model must be set in the following way for this assessment:
        1. "Environmental vs. Economics Performance Weights" shall be set at 100% Environmental Performance.
        2. "Environmental Impact Category Weights" shall be set using the EPA Scientific Advisory Board weights.
        3. "Transportation from "Manufacture to Use" shall be set at the lowest distance possible.
        4. In the "Nylon Carpet Parameters" dialogue box, set "Carpet Type" as "Carpet Tile" and "Installation Glue" as "Low VOC Glue."
    b. Carpet systems, including adhesives, must meet or exceed the Carpet and Rug Institute (CRI) Green Label Plus Indoor Air Quality Test Program.
    c. Carpet cushion shall not contain brominated flame retardants.
    d. Carpet tile applications shall be self-adhering.
    e. Resilient floorcovering must be certified under the Greenguard Environmental Institute (GEI) or RFCI FloorScore indoor emissions testing programs.
    f. Engineered wood flooring and bamboo flooring must be certified under the Greenguard Environmental Institute (GEI) or RFCI FloorScore indoor emissions testing programs.
18. Composite Wood and Agrifiber Binders: Composite wood, agrifiber products, and wood doors shall contain no added urea-formaldehyde resins.
19. Systems Furniture and Seating:
    a. Systems furniture and seating shall meet the requirements of one of the following:
        1. Greenguard Environmental Institute (GEI) certification.
        2. Scientific Certification Systems (SCS) Indoor Advantage certification
        3. Scientific Certification Systems (SCS) Indoor Advantage Gold certification.
        4. Business and Institutional Furniture Manufacturer's Association (BIFMA) Standard X7.1, as tested to BIFMA method M7.1 and as verified by an independent laboratory.
        5. Calculated indoor air concentration limits for furniture systems and seating determined by the U.S. EPA's Environmental Technology Verification Large Chamber Test Protocol for Measuring Emissions of VOCs and Aldehydes testing protocol as conducted in an independent air quality testing laboratory.
    b. Systems furniture and seating made with coatings or sealants that contain any of the following solvents are not permitted: naptha, benzene, toluene, xylene, hexavalent chromium.
20. Entryway Systems: Walk-off systems to capture particulates shall be installed at least 12 feet long in the direction of entry travel at entryways directly connected to the outdoors that are used as regular entry points by building users. Acceptable entryway systems include:
    a. Permanently installed grates, grilles, or slotted systems that allow for cleaning beneath them.
    b. Permanently installed direct glue-down walk-off mats.
    c. Non-permanent roll-out mats, but only if a service organization is contracted for maintenance on a weekly basis.
21. Air Filtration: Install air filtration media that provides a Minimum Efficiency Reporting Value (MERV) of 13 or better in air handling units for processing both return and outside air that is delivered to the air supply system. Replace filtration media after the completion of construction

and prior to occupancy.

22. Mercury in Lighting:
    a. Provide only low-mercury fluorescent or HID lamps with mercury content limited to the following:
        1. T-5 and T-8 fluorescent lamps: 80 picograms per lumen hour.
    b. Measurement Standards: Lumens to be measured according to IES LM9 for linear fluorescent lamps, IES LM66 for compact fluorescent lamps, and LM51 for HID lamps; mercury content to be measured according to U.S. EPA "Total Mercury by Cold Vapor Absorption Method" 7471A.
23. Lighting Controls: Install and calibrate controls as specified by Division 26 - ELECTRICAL in order to comply with LEED IAQ lighting controllability requirements.
24. Thermal Comfort: Install and calibrate controls as specified in Section 23 - HEATING, VENTILATING AND AIR CONDITIONING.
25. Blended Cement Concrete:
    a. Cementitious Materials: Provide composite mix of portland cement and ground granulated blast-furnace slag or fly ash or blended hydraulic cement and limit percentage (by weight) of portland cement (ASTM C150) in aggregate (total weighted average of cementitious material weight for mixes and pours) to 40% less than standard regional concrete mix designs.
    b. Limit percentage (by weight) of standard portland cement, to the following maximum percentages of the cementitious portion of the mix while maintaining the above-40% required reduction in portland cement across the Project's total quantity of concrete:
        1. Footings: 50%.
        2. Slab on Grade: 60%, except for cold-weather pours.
        3. Insulated Concrete Form Concrete: 40%.
        4. Elevated Slabs: 60%, except for cold-weather pours.
        5. Exterior Concrete: 75%.
26. Gypsum Board: Standard paper-faced gypsum board can be used only in dry climates, where wetting during or after construction is not anticipated. In humid climates, where dampness and condensation are a concern, use only non-paper-faced gypsum board. In wet locations a cementitious board, made of portland or magnesium oxide cement, must be used.
27. Fiberglass Insulation: Fiberglass batt insulation shall contain no formaldehyde-based binders or shall be third-party certified for conformance with Greenguard Children & Schools or Indoor Advantage Gold.
28. Duct Acoustical Insulation: Mechanical sound insulation materials within the duct shall consist of an impervious, non-porous coating that prevents dust from accumulating in the insulating materials.
29. Green Housekeeping:
    a. Utilize cleaning products that meet the requirements of the Green Seal GS-37 standard or comply with the requirements and maximum VOC limits of Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 8.5, Article 2, Regulation for Reducing VOC Emissions from Consumer Products.
    b. Utilize janitorial paper products and trash bags that meet the minimum percentages of post-consumer recycled content and recovered content requirements of EPA's Comprehensive Procurement Guidelines.

3. EXECUTION:

A. CONSTRUCTION WASTE MANAGEMENT:
1. Develop and implement a Construction Waste Management Plan (CWMP), as defined in Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT quantifying material diversion by weight in order to recycle, reuse, and/or salvage at least 95% (by weight) of construction, demolition, and land-clearing waste.
2. Clean materials which are contaminated prior to placing in collection containers. Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
3. Utilize any on-site existing paving materials that are scheduled for demolition as granulated fill or subbase material, and include the weight of this material in the calculations for material diverted from landfill disposal.
4. Arrange for materials collection by or materials delivery to the appropriate recycling or reuse facility.
5. Tax credits and other savings obtained or revenue generated for recycled or reused materials accrue to the Contractor.
6. Discuss CWMP procedures and measures as an agenda item at regular job meetings conducted during the course of work at the site, and record progress in meeting minutes.
7. Submit monthly progress reports with Applications for Payment in accordance with Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT, documenting the status of the CWMP and current diversion percentage rates.

B. CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT:
   1. Develop and implement a Construction IAQ Management Plan (CIAQMP) to prevent indoor air quality problems resulting from construction activities, including, at minimum, the following:
      a. Construction activities must meet or exceed the minimum requirements of the SMACNA IAQ Guideline for Occupied Buildings under Construction.
      b. During construction, protect absorptive materials stored on-site or installed from moisture damage as described in the Construction IAQ Management Plan (CIAQMP) defined above. Specifically:
         1. Exercise special care at all times in the storage of materials to prevent exposure to moisture.
         2. Avoid installation of gypsum board and other porous materials until the building is weather-tight.
         3. Standing water which accumulates on interior floors shall be removed on the day that it is observed.
         4. Any drywall that has retained more than 20% moisture after 48 hours following exposure to moisture, or that has evidence of mold, must be disposed of in accordance with Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
         5. The contractor shall identify and remove porous building materials that become wet or damaged by moisture within 7 calendar days of such exposure.
      c. During construction and HVAC system installation, provide the City with photographs of IAQ management measures (such as protection of ducts and on-site or installed absorptive materials), including six photographs on three different occasions depicting implemented SMACNA approaches.
   2. Air Filtration:
      a. Install air filtration media that provides a Minimum Efficiency Reporting Value (MERV) of 13 or better in air handling units for processing both return and outside air that is delivered to the air supply system; replace filtration media after the completion of construction and prior to occupancy.
      b. Install air filtration media that provides a Minimum Efficiency Reporting Value (MERV) of 8 or better for filtration media installed at return air grilles during construction if permanently installed AHUs are used during construction. Inspect weekly and replace as required.
   3. Discuss CIAQMP procedures and measures as an agenda item at regular job meetings conducted during the course of work at the site, and record progress in meeting minutes.
      a. Flush out the building or engage an independent testing and inspecting agency to conduct a baseline indoor air quality testing program after the completion of construction and prior to occupancy in accordance with Section 01 81 19 - INDOOR AIR QUALITY TESTING.

C. COMMISSIONING: Building energy-related systems and building envelope components shall be commissioned in accordance with the requirements of Section 01 91 00 - GENERAL COMMISSIONING REQUIREMENTS and related commissioning sections in other divisions in order to verify and ensure that fundamental building elements and systems are installed, constructed, calibrated to operate, and perform according to the City's Project Requirements, Basis of Design, and Construction Documents.

D. MEASUREMENT & VERIFICATION:
   1. For new construction, comply with the requirements of the Efficiency Valuation Organization (EVO) International Performance Measurement & Verification Protocol (IPMVP), Volume III: Concepts and Options for Determining Energy Savings in New Construction, Option B or D.
   2. For existing buildings, comply with the requirements of the Efficiency Valuation Organization (EVO) International Performance Measurement & Verification Protocol (IPMVP), Volume I: Concepts and Options for Determining Energy and Water Savings, Option B or D.

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INDOOR AIR QUALITY TESTING Section 01 81 19

1. GENERAL:

A. SUMMARY:
1. General: Provide Indoor Air Quality Testing, as shown and specified per Contract Documents if flushout fails to meet requirements. This section provides requirements for Baseline Indoor Air Quality (IAQ) Testing for maximum indoor pollutant concentrations for acceptance of the facility.
2. Related Work:
   a. Sustainable Design: Refer to Section 01 81 13 - SUSTAINABLE DESIGN REQUIREMENTS.
   b. Commissioning: Refer to Section 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS.
   c. Testing: Refer to Section 23 05 93 - TESTING, ADJUSTING AND BALANCING FOR HVAC.

B. REFERENCES:
1. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE): ASHRAE 62.1 - Ventilation for Acceptable Indoor Air Quality.
2. American Society for Testing and Materials (ASTM): ASTM D5157 - Standard Guide for Statistical Evaluation of Indoor Air Quality Models.
3. California Office of Environmental Health Hazard Assessment (OEHHA): Air Toxicology and Epidemiology list of chronic inhalation Reference Exposure Levels (RELs)
4. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): IAQ Guidelines for Occupied Buildings Under Construction.
5. U. S. Environmental Protection Agency (EPA):
   a. General: Guidelines for Energy Management.
   b. Indoor Air Quality (IAQ): Testing for Indoor Air Quality, Baseline IAQ, and Materials.

C. SUBMITTALS:
1. General: Submit test reports.
2. Baseline IAQ Testing: Submit a report for each test site specified for IAQ baseline testing as specified in this section and in Section 23 05 93 - TESTING, ADJUSTING AND BALANCING FOR HVAC. Report on air concentrations of targeted pollutants identified in paragraph 3.A of this section.

D. SEQUENCING AND SCHEDULING: Identify, program, and schedule IAQ testing well in advance of construction in a manner to prevent delays to the performance of the work of this Contract in order to perform and complete all testing after the completion of construction activities and prior to occupancy.

2. PRODUCTS:

NOT USED

3. EXECUTION:

A. BASELINE IAQ TESTING:
1. HVAC System Verification: To assure compliance with recognized standards for indoor air quality including ASHRAE 62.1, the Contractor's independent testing and balancing agency shall verify the performance of each HVAC system prior to Indoor Air Quality testing, including space temperature and space humidity uniformity, outside air quantity, filter installation, drain pan operation, and any obvious contamination sources.
2. Indoor Air Quality Testing: Upon verification of HVAC system operation, the Contractor shall hire an independent contractor, subject to approval by the City, with a minimum of 2 years experience in performing the types of testing specified herein, to test levels of indoor air contaminants for compliance with specified requirements.
   a. Conduct baseline IAQ testing using testing protocols consistent with the United States Environmental Protection Agency Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
   b. A test plan shall be submitted for the approval of the City. The plan shall specify procedures, times, instrumentation, and sampling methods that will be employed.
   c. Perform IAQ testing for at least the minimum number of required sampling locations, determined as follows: For each portion of the building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft., or for each contiguous floor area, whichever is larger, and include areas with the least ventilation as calculated by Ventilation Rate Procedure of ASHRAE 62.1 and greatest presumed source strength as identified by City. Collect air samples on three consecutive days and average the results of each three-day test cycle to determine compliance or non-compliance of indoor air quality for each air handling zone tested.
      1. Verify areas to be tested with the City. Areas with 100% outside air ventilation rates such as laboratories are excluded from these testing requirements. The City is the sole judge

of areas exempt from testing.

d. Perform IAQ testing following the completion of all interior construction activities and prior to occupancy. The building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Perform testing prior to installation of furniture, workstation components, and casework.
e. Perform IAQ testing within the breathing zone, between 3'–0" and 6'–0" above the finished floor and over a minimum 4-hour period.
f. Collect air samples during normal occupied hours (prior to occupancy) with the building ventilation system starting at the daily normal start times and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
g. Sample and record outside air levels of formaldehyde and TVOC contaminants at three outside air locations (as determined by City) simultaneously with indoor tests to establish basis of comparison for these contaminant levels by averaging the three outdoor readings for each contaminant.
h. Perform airborne mold and mildew air sampling and speciation with simultaneous indoor and outdoor readings.
    1. Samples are to be collected using a 12 liter-per-minute pump and a 0.45 micron polycarbonate filter, with a 4-hour duration for each sample.
    2. Speciation shall be done with DNA detection using the quantitative polymerase chain reaction (QPCR) method. To ensure that filters are not precontaminated with mold, a field blank filter cartridge shall be tested after every eighth sample is tested.
i. Acceptance of respective portions of the building by the City is subject to compliance with specified limits of indoor air quality contaminant levels.

3. Indoor air quality shall conform to the following standards and limits:
    a. Formaldehyde: <20 microgram/m3 (16.3 ppb)
    b. Sum of VOCs: <200 microgram/m3
    c. Carbon Monoxide: Not to exceed 9 ppm
    d. Other Compounds: Refer to the California Office of Environmental Health Hazard Assessment (OEHHA) Air Toxicology and Epidemiology list of chronic inhalation Reference Exposure Levels (RELs) are not to exceed those levels.
    e. Airborne Mold and Mildew: The species identified in indoor air cannot vary by more than 10% from those identified in the exterior samples.
4. Test Reports: Prepare test reports showing the results and location of each test, a summary of the HVAC operating conditions, and a listing of any discrepancies and recommendations for corrective actions, if required.
    a. Include certification of test equipment calibration with each test report.
5. For each sampling point where the maximum concentration limits are exceeded, the Contractor is responsible for conducting additional flush-out with outside air and retesting the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from the same locations as in the first test. Retesting shall be performed at no additional expense to the City.
6. For each sampling point where the airborne mold and mildew indoor species distribution varies by more than 10% from exterior sampling speciation, Contractor shall identify the source of the mold and/or mildew and remediate with corrective action, then retest in accordance with section 3.A.2 above until compliant results are attained.
7. In the event that any non-compliant test results occur, Contractor must provide a written report to the City describing the source(s) of the non-compliant condition(s) and the corrective action(s) implemented.

B. INDEPENDENT MATERIALS TESTING:
1. Materials That Must Be Tested: All materials listed below that are proposed for use on this project shall be tested for permanent, in-place indoor air quality performance in accordance with requirements of these specifications. Results shall be furnished to the City. Materials meeting the criteria for independent testing are as follows:
    a. Field-applied paint systems on appropriate substrate. Paint primers and intermediate coats (if used) should be applied with a typical drying time allowed between coats (not to exceed 7 days).
    b. Wallcoverings.
    c. Carpet including manufacturer's recommended adhesive. The carpet will be applied to the appropriate flooring per manufacturer's instructions so that the testing is of the "carpet assembly."
    d. Ceiling tile.
    e. Interior furnishings.
    f. Any fireproofing material that may be exposed to indoor air, directly or in a plenum, applied to appropriate substrate.
2. Materials for Testing: Only test representative samples of actual products selected for use on this

project. Tests of products generically and/or technically similar but produced by a manufacturer other than that of the product selected for use on this project are invalid.

3. Materials Testing and Evaluation Protocol: California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.
4. Performance Thresholds: All compounds detected that have chronic reference exposure levels listed in the California DHS Standard Practice document shall be analyzed and compared to the allowable concentration levels.
5. Materials Test Reports: Submit test reports to the Contracting Officer's Representative. The report shall include raw emission levels, as well as the calculated resulting concentrations and the assumptions (loading, volume of space, ventilation rates) used to determine those resulting concentrations.
6. Product/Material Evaluation: All products/materials shown by testing to comply with emissions limits and other criteria specified in this section will be approved for use on this project subject to compliance with all other specified requirements of the Project Manual. Products/materials shown to exceed specified emission limits shall be discussed, test results interpreted, and a determination made as to alternative product uses or selections.

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GENERAL COMMISSIONING REQUIREMENTS Section 01 91 13

1. GENERAL:

A. SUMMARY: Provide General Commissioning Requirements, as shown and specified per Contract Documents, project Commissioning Plan, and LEED BD+C for Building Design & Construction.
   1. Commissioning is the process of ensuring that systems are designed, installed, functionally tested, and capable of being operated and maintained to perform in conformity with the City's Project Requirements (or design intent) and the Contract Documents. (As described by LEED.)
   2. Commissioning is a planned, systematic quality-control based process that involves the owner, users, occupants, operations and maintenance staff, design professionals, and contractors. It begins at project inception; has ongoing verification of achievement of the owner's project requirements; requires integration of contractor-completed commissioning process activities into the construction documents; aids in the coordination of static and dynamic testing that acceptance is based on; verifies staff training; and concludes with warranty verification and lessons-learned documentation and implementation. (As described by LEED.)
   3. In addition the responsibilities of the commissioning process are to:
      a. Verify that the work is installed in accordance with the Contract Documents, the Design Intent (or OPR), and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup. Startup reports and Construction (Prefunctional Installation) Checklists executed by the Contractor are required.
      b. Verify and document that functional performance is in accordance with the Contract Documents. Functional Tests executed by the Contractor and witnessed by the Commissioning Authority are required.
      c. Verify that operation and maintenance manuals submitted to the owner are complete. Detailed operation and maintenance (O&M) data submittals are required from the Contractor.
      d. Verify that the owner's operating personnel are adequately trained. Formal training conducted by the Contractor is required.
   4. Acceptance verification, including Functional Tests, O&M documentation review, and training, are to occur after startup and initial checkout and to be completed before (and be necessary for) Substantial Completion.
   5. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.
   6. The Commissioning Authority is employed by the City.

B. RELATED DOCUMENTS:
   1. General: Sections 00 70 00 - GENERAL CONDITIONS, 00 73 00 - SUPPLEMENTARY CONDITIONS and Division 01 - GENERAL REQUIREMENTS, apply to the Work of this Section.
   2. Section 23 09 80 - MECHANICAL COMMISSIONING.
   3. Commissioning Plan: To be prepared within thirty (30) days of authorization to proceed per Section 23 08 00 - COMMISSIONING OF HVAC.

C. DEFINITIONS:
   1. Commissioning Authority (CxA): The Commissioning Authority is a reviewing entity that will verify that the City's Operational Performance Requirements are achieved and assist the City by providing quality improvement.
   2. Commissioning Plan (CxP): The Commissioning Plan is a document defining the commissioning process, which is developed in increasing detail as the project progresses through its various phases.
   3. Commissioning Report (CxR): The Commissioning Report is the document that records the results of the commissioning process, including the as-built performance of the HVAC system and unresolved issues.
   4. Commissioning Specification: This is the contract document that details the objective, scope, and implementation of the construction and acceptance phases of the commissioning process as developed in the design-phase commissioning plan.
   5. Commissioning Team: This includes the people responsible for working together to carry out the commissioning process.
   6. Owner's Project Requirements or Design Intent (OPR): This is a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. This typically is an expansion of the information in the owner's program.
   7. Functional Performance Test (FPT): This is the process of determining the ability of the HVAC system to deliver heating, ventilating, and air-conditioning services in accordance with the final design intent, both components, system, and controls. This is also the process of determining the ability of the plumbing system to deliver hot water in accordance with the final design intent. This finally is the process of determining the ability of the electrical system to deliver control of the Lighting System in accordance with the final design intent.
   8. Verification: This includes the full range of checks and tests c arried out to determine if all

components, subsystems, systems, and interfaces between systems operate in accordance with the contract documents and the design intent. In this context, "operate" includes all modes and sequences of control operation, interlocks and conditional control responses, and specified responses to abnormal or emergency conditions.

9. Major Problem: Any problem or group of problems that require more than fifteen (15) minutes to correct.

D. INCLUDED SYSTEMS:
   1. The following systems, equipment and their components are included in the scope of the commissioning activities and are considered to be commissioned systems and equipment.
      a. Division 22 - PLUMBING. domestic hot water.
      b. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING, HVAC and controls (BAS or EMS).
      c. Division 26 - ELECTRICAL, Lighting Control.

E. ROLES AND RESPONSIBILITIES:
   1. Prime Contractor (hereafter referred to as "Contractor" or "Prime Contractor"):
      a. The Contractor shall be responsible for the quality of construction.
      b. The Contractor shall be responsible for communicating to the CxA the construction schedule, milestones, completion schedules, planned testing, etc., including updates in the same fashion, timeliness and level of detail as is provided to the City.
      c. The Contractor shall incorporate commissioning-related activities into the overall project schedule.
      d. The Contractor shall ensure that each trade maintains accurate record drawings at the job site throughout the construction phase. The Contractor shall make these drawings readily available for review and use by the CxA at any time during normal business hours.
      e. The Contractor shall ensure that each subcontractor cooperates and provides information, assistance, and responses to the CxA as described herein.
   2. Subcontractors (hereafter referred to as "Contractor" or "Subcontractor"):
      a. The Subcontractor shall provide personnel, equipment and materials necessary to fulfill its obligations in the commissioning process as described in this section and its discipline-specific commissioning specification.
      b. The Subcontractor shall attend all commissioning meetings as requested by the Prime Contractor.

F. REFERENCES:
   1. LEED for Building Design & Construction: Fundamental Cx (EAp1) & Enhanced Cx (EAc3) - LEED version 2009 NC.
   2. AABC Commissioning Group: "Associated Air Balance Council - Commissioning Group."
   3. CALGreen Code 5.410.2.

2. PRODUCTS:

A. TEST EQUIPMENT:
   1. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing.
   2. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost.

3. EXECUTION:

A. COMMISSIONING TEAM:
   1. Each Contractor shall designate an individual to be responsible for coordinating commissioning activities with the CxA. This requirement is intended to facilitate effective communication during the commissioning process.
   2. The commissioning team consists, at a minimum of the following:
      a. Commissioning Authority.
      b. City.
      c. Design Engineers (Fire Suppression, Plumbing, HVAC, Integrated Automation, Electrical, Communications, Electronic Security and Safety and Specialty Consultants).
      d. Prime Contractor.
      e. Division 21, 22 , 23 and 25 Contractor(s) and its Subcontractors (particularly controls, EMS or BAS).
      f. Division 26 Contractor(s) for Lighting Controls and its Subcontractor (if applicable).

B. COMMUNICATION PROTOCOLS:
   1. Formal reports including Site Observation Reports will be distributed to the City and Prime Contractor.
   2. Informal comments and observations from the commissioning work will be relayed directly to the

responsible party whenever possible, with copies to the City and Prime Contractor. This includes field observations and functional performance test results. The direct communication approach will avoid delays from traditional remote paper exchanges, will encourage dialogue and discussion of options and alternatives, and generally maintain an atmosphere of cooperation and quality.

3. Response Times:
   a. Timeliness in delivering information or providing responses to the CxA is essential to providing the construction product to the City on time, as well as facilitating the commissioning process.
   b. Itemization of specific activities will be as follows:
      1. Delivery of draft O&M manuals to CxA: Thirty (30) days following submittal review and approval of the corresponding commissioned system.
      2. Return of corrected draft into final O&M manual form: Thirty (30) days prior to the scheduled training of the corresponding commissioned systems.
      3. Delivery of proposed training material to CxA: Thirty (30) days prior to the scheduled training of the corresponding commissioned systems.
      4. Delivery of testing, balancing and adjusting plan to CxA: Thirty (30) days after contract award.
      5. Delivery of testing, balancing and adjusting report to CxA: One (1) week after completed TAB work.
      6. Written response to a site observation comment to CxA: One (1) month from receipt of comment.
      7. Written response regarding the acceptability of the functional testing procedures to CxA: One (1) month from receipt of the testing procedures.
      8. Time to correct discrepancies noted in Record Drawings during construction phase: Two (2) weeks from the date the discrepancy was noted.

C. COMMISSIONING MEETINGS:
   1. Most commissioning issues will be handled during regularly scheduled project meetings. If specific topics require additional discussion, the commissioning team shall meet immediately after the project meeting.
   2. Other commissioning meetings may occur at other times mutually agreed to by the commissioning team.

D. SUBMITTAL REVIEW:
   1. In addition to the submittal requirements required elsewhere, the Contractor shall provide the CxA the following submittal information for equipment and systems to be commissioned:
      a. Detailed product data for each piece of equipment including capacities, electrical components and requirements, start-up procedures, etc.
      b. Full and part load performance curves over the expected operated ranges for each piece of equipment that will operate at variable loads.
      c. Manufacturers' certified equipment test reports, where applicable.
      d. Manufacturers' detailed installation requirements.
      e. Manufacturers' detailed start-up requirements.
      f. Control system diagrams and sequences of operation.
      g. Operation instructions.
      h. Warranty and City's obligations to maintain warranty.
      i. Manufacturers' recommended maintenance and troubleshooting procedures, including tools and replacement parts lists.
   2. Submittal Review Procedures:
      a. The Contractor shall provide each submittal (energy-related equipment and systems to be commissioned) in the manner specified in Section 01 33 10 - SUBMITTALS, to the CxA by providing that submittal to the City. The commissioned systems require only one submittal copy and process, but must attain the dual approval of the City as well as the CxA.
      b. The CxA will review the energy-related submittals following the City's review. This review is in addition to the submittal approval procedure used by the contractor and design professional. The focus of the CxA review will be the following:
         1. Verify that the equipment or system meets the Operational Performance Requirements including energy performance.
         2. Verify that equipment or system includes provisions for access and maintenance.
         3. Verify that sufficient information is provided for the development of the equipment checklists and functional performance test procedures.

E. COMMISSIONING SCHEDULE:
   1. The Contractor shall integrate equipment start-up, functional performance testing, and training into the master construction schedule. The CxA may assist the Contractor in developing the logic schedule for the commissioning-related activities.
   2. The Contractor shall update the schedule of commissioning-related activities at least monthly until the beginning of start-up activities.

3. The Contractor shall update the schedule of commissioning-related activities at least weekly once start-up activities have begun.

F. SITE OBSERVATIONS AND VERIFICATIONS:
1. The CxA will make site observations from time-to-time. The CxA site observation reports may include construction issues, access and maintenance issues, safety issues, or other issues. Each observation is intended to improve the project quality and achieve the City's Performance Requirements.
2. The Contractor shall respond, in writing to the CxA, to each contractor-responsible issue within seven (7) calendar days of receipt of the site observation report. The response shall state at a minimum the following.
   a. Concurrence or not on whether this is an issue.
   b. Planned corrective action.
   c. Date on when correction will be completed.
3. The Contractor shall respond in writing when the corrective action has been completed and in its opinion the issue is resolved.

G. EQUIPMENT CHECKLISTS:
1. The Commissioning Coordinator will provide the CxA the following equipment checklists:
   a. Equipment Construction (Installation) Checklist.
   b. System Construction (Installation) Checklist.
2. Intent:
   a. The Equipment or System Construction (Installation) Checklist will be used to communicate the readiness for a particular equipment or system for functional performance testing.
   b. The checklists do not contain all of the requirements of the Contract Documents. The completion of the checklist does not eliminate the Contractor's responsibility for meeting other requirements in the Contract Documents.
3. Use and Process:
   a. All checklists will be provided by the Contractor for each piece of equipment to be commissioned.
   b. The Contractor shall complete each checklist. The Contractor shall document and explain any negative responses to any line item of the checklist at the end of the checklist.
   c. As each checklist is completed, the Contractor shall provide the original to the CxA and maintain a copy on site.
   d. The Contractor shall provide each completed checklist to the CxA according to the following schedule:
      1. Equipment Construction (Installation) Checklist: Minimum of ten (10) working days prior to scheduling of any functional performance tests related to that equipment.
      2. System Construction (Installation) Checklist: Minimum of ten (10) working days prior to scheduling of any functional performance tests related to that system.
   e. The CxA shall have a minimum of ten (10) working days to verify at its discretion whether the checklists have been completed satisfactorily before scheduling of any functional performance tests related to that equipment.

H. FUNCTIONAL PERFORMANCE TESTING:
1. General:
   a. The Contractor shall demonstrate that the commissioned equipment and systems operate properly in all modes of operation.
   b. Testing shall begin at the component level and progress upwards in complexity to the equipment and system level.
   c. When all systems have passed their functional performance tests, the Contractor shall demonstrate that the systems operate correctly as a whole in a System Integration Test.
2. Functional Performance Test (FPT) Procedures:
   a. The CxA will provide the FPT procedures to the Contractor and all applicable Subcontractors a minimum of ten (10) days before testing, for review.
   b. The Contractor shall review the draft FPT procedures and reply, in writing, whether the tests as written are acceptable and will not void any warranties. The Contractor shall submit any requested modifications to the test procedures in writing to the CxA a minimum of thirty (30) days prior to scheduled start of functional testing. Failure on the part of the Contractor to submit any modifications to the draft FPT procedures shall signify the Contractor's concurrence that the procedures are acceptable.
   c. The FPT procedures will provide step-by-step instructions in a pass/fail format.
3. The Contractor shall complete and submit all applicable Equipment or System Construction (Installation) Checklists prior to scheduling of functional testing.
4. When the equipment and systems are ready to test, the FPT will be scheduled for a time mutually convenient to the Contractors and the CxA.
5. The CxA will orchestrate the Functional Performance Test. The Contractor shall be responsible to provide personnel and equipment to perform the testing and to correct problems found during the testing. The Contractor shall provide means of access in compliance with OSHA regulations

to the CxA to visually verify all aspects of the specified test.

6. If the total time required to correct minor problems during testing is greater than fifteen (15) minutes, the test shall be considered failed and must be repeated in its entirety.
7. If a major problem is discovered during the test, the Contractor shall correct the problem. Prior to retesting, the Contractor shall submit to the CxA the required data indicating that the deficient items have been corrected. After review of this information by the CxA, a retest will be scheduled. During the course of the retest, if at any point a major deficiency is discovered, the test will be stopped. If more than two functional performance tests (one initial test and one retest) for any type of equipment are required, the costs for the CxA to witness retesting of similar types of equipment until satisfactory results are obtained shall be the responsibility of the Contractor.
   a. A major problem is any problem or group of problems that require more than fifteen minutes to correct.
   b. A type of equipment is equipment that belongs to a common category, for example, Air Handling Unit or Panelboard.

I. TRAINING VERIFICATION:
1. The Contractor shall submit proposed training material to the CxA for review and comment.
2. The Contractor for the respective system shall be responsible for the development and implementation of the training material for that system.
3. The Contractor shall provide final Operation and Maintenance (O&M) manuals and training materials to the City and CxA prior to training.
4. At a minimum, the Contractor shall provide the following material at the time of training:
   a. Detailed agenda.
   b. Contractor contact information sheet.
   c. Detailed training material (divided by sections where appropriate).
   d. Log sheets and maintenance checklists
   e. Training may be recorded for future reference if requested by the City.
5. The Contractor shall develop a proposed training schedule and submit that to the City for review, comment and approval.
6. The Contractor shall schedule and coordinate all training sessions through the City.
7. The Contractor shall provide training for all of the equipment and systems included in the following divisions:
   a. 22 - PLUMBING: Domestic hot water.
   b. 23 - HEATING, VENTILATING AND AIR CONDITIONING: Controls (BAS or EMS).
   c. 26 - ELECTRICAL: Lighting controls.
8. At a minimum, training topics shall include the following:
   a. Description of equipment and systems.
   b. Warranties and guarantees.
   c. Equipment start-up and shutdown.
   d. Normal and emergency operation.
   e. Seasonal changeover.
   f. Maintenance schedules.
   g. Health and safety issues.
   h. Special tools and spare parts.
   i. Emergency procedures.
   j. Hands-on operation.
   k. Troubleshooting.
   l. O&M manuals.
   m. Facilities control system and sequences of operation.

J. SYSTEMS MANUAL:
1. Contractor will provide a Systems Manual in addition to Operations and Maintenance documentation. The Systems Manual will include at a minimum:
   a. MEP Systems Narrative: Includes description of systems design, including equipment schedules, capabilities and limitations, Basis of Design, etc.
   b. As-built sequence of operations for all equipment, including time-of-day schedules and schedule frequency (adjustable set-points not specifically addressed in documentation), and detailed points listings with range and initial set-points.
   c. As-built single line diagrams.
   d. Equipment startup and shutdown procedures and recommended seasonal adjustments.
   e. TAB report.
   f. List of trend logs and reports for building management.
   g. Schedule of Maintenance Requirements.

* End Division 01 *

Division 02 - EXISTING CONDITIONS

DEMOLITION Section 02 41 00

1. GENERAL:

A. SUMMARY:
1. General: Provide Demolition, as shown and specified per Contract Documents.
2. Retained Items: Carefully remove items to remain property of Owner and be reinstalled in the work.

B. REFERENCES:
1. American National Standards Institute (ANSI): ANSI 10.2 - Safety Code for Building Construction.
2. American Society of Safety Engineers (ASSE): ANSI/ASSE A10.6 - Safety Requirements for Demolition Operations - American National Standard for Construction and Demolition Operations.
3. California Occupational Safety and Health Administration (CalOSHA): Construction Safety Orders; 29 CFR, PART 1926 Safety and Health Regulations for Construction.
4. Concrete Sawing and Drilling Association (CSDA): Standards and Specifications.
5. National Fire Protection Association (NFPA): NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
6. Occupational Safety and Health Administration (OSHA): Standards.

C. SUBMITTALS:
1. Schedule: Submit a detailed sequence of demolition and removal work, including dates for shutoff, capping, and continuance of utility services.
2. Procedures: Submit written procedures documenting the proposed methods to be used to control dust and noise.
3. Project Record Documents:
   a. General: Submit under provisions of Section 01 77 00 - CLOSEOUT PROCEDURES.
   b. Capped Utilities And Subsurface Obstructions: Accurately record actual locations.]

2. PRODUCTS:

Not Used

3. EXECUTION:

A. PREPARATION:
1. General: Refer to Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
2. Scheduling:
   a. General: Coordinate and schedule demolition work as required by the Owner and as necessary to facilitate construction progress.
   b. Existing Utilities:
      1. General: Coordinate disconnection and capping of existing gas, water, sewer, electrical, telephone, cable and security system utilities; verify work is complete before starting demolition work affecting these utilities.
      2. Plumbing: Refer to Division 22 - PLUMBING; disconnecting, removing and capping existing gas, water, and sewer utilities.
      3. Electrical: Refer to Division 26 - ELECTRICAL; disconnecting, removing, and capping existing electrical utilities. Owner will make arrangements with telephone company concerning their equipment and lines.
3. Examination:
   a. General: Examine conditions of work in place before beginning work; report existence of hazardous materials or unsafe structural conditions.
   b. Hazardous Materials:
      1. General: Refer to Section 02 50 00 - SITE REMEDIATION.
      2. Identification: Identify chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations, and notify such jurisdictional agencies as may be required. Collect and legally dispose of such materials at official disposal locations away from the site.
      3. Asbestos: If asbestos or materials containing asbestos are encountered, stop work immediately and contact the Owner. Do not proceed with demolition until directed by Owner.
4. Measurements: Take field measurements; report variance between plan and field dimensions.

5. Protection:
   a. General: Refer to Division 01 - GENERAL REQUIREMENTS.
   b. Site: Protect existing adjacent installations not scheduled for demolition from damage; take measures to prevent damage to existing turf, trees, streets, curbs, walks, piping, sewers, etc., during demolition and construction.
   c. Safety Precautions: Prevent damage to existing elements identified to remain or to be salvaged, and prevent injury to the public and workmen engaged on site. Demolish roofs, walls and other building elements in such manner that demolished materials fall within foundation lines of building. Do not allow demolition debris to accumulate on site. Pull down hazardous work at end of each day; do not leave standing or hanging overnight, or over weekends.
   d. Dust: Contain and control dust produced by operations as required by jurisdictional agencies.
   e. Selective Demolition:
      1. General: Prevent movement of structure; provide required bracing and shoring.
      2. Watertight Barriers: Provide and maintain as required to prevent water intrusion and damage.
      3. Temporary Partitions: Erect and maintain to prevent spread of dust, odors and noise to permit continued Owner occupancy.
      4. Egress: Do not close or obstruct route or required width to exits.

B. DEMOLITION:
   1. General: Perform demolition as shown and remove from the site. Use methods required to complete Work within limitations of governing regulations.
   2. Explosives: Use not permitted.
   3. Utilities: Disconnect, remove, cap and identify designated utilities within demolition areas.
   4. Disposal:
      a. General: Demolished materials become property of the Contractor and shall be removed from premises, except those items specifically listed to be retained by Owner.
      b. Burning and Burying of Materials: NOT ALLOWED.
      c. Haul Routes:
         1. General: Obtain permits as required by jurisdictional agencies. Establish haul routes in advance; post flagmen for the safety of the public and workmen.
         2. Maintenance: Keep streets free of mud, rubbish, etc.; assume responsibility for damage resulting from hauling operations; hold Owner free of liability in connection therewith.

* * *

SITE REMEDIATION Section 02 50 00

1. GENERAL:

A. SUMMARY: Provide Site Remediation, as shown and specified per Contract Documents.
   1. Description of Work:
      a. The work covered by this section includes work environment during and after the performance of remediation activities.
      b. Coordination with Other Work: Coordinate remediation activities. Coordination procedures shall be explained in the Contractor's Accident Prevention Plan and shall describe how the Contractor will prevent lead exposure to other Contractors and/or other personnel performing work unrelated to remediation activities.
   2. Related Work:
      a. General: The following items of Work are related to the Work of this Section but specified elsewhere in this Project Manual.
      b. Management and Disposal of Waste: Refer to Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT.
      c. Demolition: Refer to Section 02 41 00 - DEMOLITION.

B. REFERENCES:
   1. General: City of San Diego, Environmental Services Department (ESD) - Asbestos and Lead Management Program, Asbestos-Lead Scope of Work - Section 02081 - Station Demolition.
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced standard specifications.
   3. State of California Department of Industrial Relations: Title 8, California Code of Regulations, Section 1532.1 - Lead.
   4. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
   5. U. S. Environmental Protection Agency (EPA):
      a. General: Laws and regulations.
      b. 40 CFR 61.145: Standard for Demolition and Renovation.
      c. 40 CFR Part 763, Appendix D to Subpart E: Transport and Disposal of Asbestos Waste.
      d. 40 CFR 745, Section 65: Lead-based Paint Hazards.
      e. 40 CFR 745, Section 223: Definitions (Lead-based Paint Hazards).

C. ADMINISTRATIVE REQUIREMENTS:
   1. Licenses, Permits and Notifications: The Contractor shall certify in writing to the local environmental protection agency responsible for remediation activities, at least 10 days prior to the commencement of work, that all licenses, permits and notifications have been obtained. The Contractor is responsible for all associated fees or costs incurred in obtaining the licenses, permits and notifications.
   2. Training: Training to meet remediation requirements shall be provided by an EPA accredited training provider and the Contractor shall provide proof in the Qualifications and Organization Report showing that personnel have passed certification examinations for their respective disciplines, that fees for certification have been paid to the EPA (or to the state for state-run programs) and that the EPA has certified the supervisor, risk assessor, workers to perform their duties.
   3. Sampling and Analysis: As required by federal and state requirements.

D. SUBMITTALS:
   1. Product Data:
      a. Materials, Equipment, and Expendable Supplies: A description of the materials, equipment and expendable supplies required; including Material Safety Data Sheets (MSDS) for material brought onsite to perform the work.
      b. Qualifications: A report providing evidence of qualifications and designating responsibilities for personnel and laboratories.
   2. Test Reports:
      a. Licenses, Permits, and Notifications: Certification that licenses, permits, and notifications have been obtained as required.
      b. Sampling and Analysis: A log of the analytical results from sampling conducted during the remediation. The log of results shall be kept current with project activities and shall be briefed to the Contracting Officer as analytical results are reported.
      c. Abatement Report: Report written by the certified supervisor covering each element of the remediation.

E. QUALITY ASSURANCE:
   1. Qualifications and Organization Report: The Contractor shall furnish a qualification and organization report. The report shall describe the qualifications of the certified supervisor, certified risk assessor, and certified workers. The report shall include an organization chart showing the Contractor's personnel by name and title and project specific responsibilities and authorities. The report shall describe the qualifications of the laboratories selected for this project. The report shall be signed by the Contractor and the certified supervisor to indicate that all personnel and laboratories comply with certification and experience requirements of this Section and that project personnel have been given the authority to complete the tasks assigned to them.

2. PRODUCTS:

A. General: All products and materials required for site remediation shall conform to the requirements of federal and state requirements and the City of San Diego, Environmental Services Department (ESD) Asbestos and Lead Management Program, Asbestos-Lead Scope of Work - Section 02081 - Station Demolition report following this Section.

3. EXECUTION:

A. PREPARATION: Examine conditions of work in place before beginning work.
B. WORK PROCEDURES:
   1. General: All labor, equipment and procedures required for site remediation shall conform to the requirements of federal and state requirements and the City of San Diego, Environmental Services Department (ESD) Asbestos and Lead Management Program, Asbestos-Lead Scope of Work - Section 02081 - Station Demolition report following this Section.
   2. Performance: Execute work following practices and procedures in project work plans.

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THE CITY OF SAN DIEGO

ENVIRONMENTAL SERVICES DEPARTMENT

ASBESTOS & LEAD MANGEMENT PROGRAM

ASBESTOS-LEAD SCOPE OF WORK

SECTION 02081

for

Station Demolition

on

Fire Station 05

November 5, 2012

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SECTION 02081 – ASBESTOS AND LEAD MATERIALS

PART 1 - GENERAL

1.1 SUMMARY SCOPE OF WORK

The City of San Diego's Asbestos and Lead Management Program (ALMP) has performed a hazardous materials inspection of Fire Station #05 to identify asbestos/lead containing materials, and other hazardous materials (refer to Appendix A for a summary). The City will perform the following abatement measures in coordination with the CONRACTOR to accommodate the facility demolition:

1) Asbestos and Lead containing materials were identified as a result of previous inspections. See Appendix A below for a summary of materials tested for asbestos content.

2) The City's as needed abatement contractor will remove all loose and flakey paint that is in hazardous condition. Removable building components with lead will be removed by the City's as needed abatement contractor prior to demolition. Remaining intact paint on the exterior walls will be demolished in place and the demolition contractor will use methods that are in compliance with Title 8 California Code of Regulations, Section 1532.1 the Lead in Construction Standard.

3) The City's as needed abatement contractor will remove the floor tile and mastics from the Bull Pen and Chief's restroom areas prior to demolition.

4) Approximately 90 mercury containing fluorescent light bulbs and 45 PCB containing ballasts which are present in the building will be removed and properly disposed by the City's as needed abatement contractor.

NOTE: The removal of these materials shall NOT be included in the cost of this contract.

2.1 SAMPLE COLLECTION

The inspection and sampling performed by the ALMP was conducted without using destructive methods. Therefore, it is possible for the CONTRACTOR to encounter additional suspected hazardous materials within wall cavities or plenum areas. The CONTRACTOR and his staff shall remain vigilant in identifying any suspected materials that have not yet been tested.

If additional suspected asbestos materials or deteriorated painted surfaces to be impacted are identified that have not been previously tested or have not been including

in the abatement scope of work, stop work in that area and immediately notify the ALMP.

Within 24 hours on a work day, the ALMP staff will undertake confirmation of the material and determine if abatement is required. If additional abatement is required, the City will conduct such abatement at no cost to the CONTRACTOR.

The CONTRACTOR and his sub-contractors shall remain out of the work area if abatement is required. There will be no additional financial compensation to the CONTRACTOR during the removal of this asbestos and/or lead containing materials.

The CONTRACTOR shall follow Tile 8 CCR, Section 1532.1. Lead.

The 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.

If the CONTRACTOR salvages components or building materials that have intact lead coatings on them, he shall ensure the lead is disclosed to all persons accepting their salvaged material. Submit to the City a letter of evidence from the person accepting the lead coated salvaged material.

APPENDIX A

LABORATORY RESULTS

1. Overview

The City of San Diego's Asbestos and Lead Management Program (ALMP) was requested to perform asbestos and lead inspection services for Fire Station #05 (Facility #208). Inspections were performed on several occasions between 2001 and 2010.

2. Asbestos Bulk Sample Laboratory Results

Fire Station #05 Previous Asbestos Sample Results				
SAMPLE #	**TYPE OF MATERIAL**	**LOCATION**	**CONDITION**	**ASBESTOS**
5327-1A	Wall plaster	Bull pen	Good	ND
5327-1B	Wall plaster	Battalion Chief office	Good	ND
5327-1C	Wall plaster	Dorm	Good	ND
5327-2	**Black 9"x 9" floor tile**	**Bull pen, Captain's office, Chief's bathroom**	**Good**	**1-4%**
5327-3	Black floor tile mastic	Bull pen, Captain's office, Chief's bathroom	Good	ND
5327-4	Duct tape	Roof ducts	Good	ND
5327-5	Duct mud	Roof ducts	Good	ND
5327-6	Black mastic	Roof ducts	Good	ND
5327-7	Black roof mastic	Roof	Good	ND
5327-8	Silver paint	Roof	Good	ND
5050	1'x1' ceiling tile	Bull pen	Good	ND
7785	1'x1' ceiling tile	Bull pen	Good	ND
8138	1'x1' ceiling tile	Bull pen	Good	ND
2888-1	Ceiling plaster	Apparatus room	Good	ND
2888-2	Light gray speckled sheet vinyl	Hallway, restroom	Good	ND
2888-3	Sheetrock	Hallway by restroom	Good	ND
2888-4	Roof core	Roof	Good	ND
6470-1	Roof penetration mastic	Roof	Good	ND
6470-2	Window putty	Exterior windows	Good	ND
6470-3	Roof duct mastic	Roof	Good	ND
6470-1FT	**Black 9"x9" floor tile**	**Captain's office**	**Good**	**<1%**
6470-2M	Floor tile mastic	Captain's office	Good	ND
6470-2 (7/13/10)	Floor leveling compound	Captain's office	Good	ND

3. Lead Positive XRF Sample Results

Fire Station #05 Positive Lead Sample Results June 24, 2010				
SAMPLE #	COMPONENT	LOCATION	CONDITION/COLOR	LEAD CONCENTRATION
32	Wall	Exterior	Intact/White	1.5 mg / cm^2
33	Wall	Exterior	Intact/White	1.8 mg / cm^2
34	Wall	Exterior	Intact/White	1.4 mg / cm^2
35	Wall	Exterior	Intact/White	1.5 mg / cm^2
36	Wall	Exterior	Intact/White	2.2 mg / cm^2
37	Wall	Exterior	Intact/Tan	3.8 mg / cm^2
38	Wall	Exterior	Intact/Tan	2.9 mg / cm^2
39	Wall	Exterior	Intact/Tan	3.9 mg / cm^2
41	Door frames	Exterior	Intact/Red	2.9 mg / cm^2
42	Deco Brick	Exterior	Intact/White	2.4 mg / cm^2
61	Ceramic Tile	Int. Chief's office	Intact/White	11.8 mg / cm^2
62	Ceramic Tile	Int. Chief's office	Intact/White	10.4 mg / cm^2
63	Ceramic Tile	Int. Chief's office	Intact/Red	12.0 mg / cm^2
70	Ceramic Tile	Int. Dorm Windows	Intact/Red	11.7 mg / cm^2
73	Ceramic Tile	Int. Chief's office	Intact/Tan	17.1 mg / cm^2
74	Ceramic Tile	Int. Chief's office	Intact/Tan	17.0 mg / cm^2
75	Ceramic Tile	Int. Chief's office	Intact/Red	14.3 mg / cm^2

4. Universal Waste

Fire Station #05 Universal Waste		
TYPE OF MATERIAL	LOCATION	Quantity
Fluorescent Light Tubes	Throughout Facility	90
PCB Containing Light Ballasts	Throughout Facility	45

Note: This survey did not include materials concealed behind walls and hard ceilings or below grade. If suspected materials are found during demolition/deconstruction activities that are not mentioned in this report work must stop immediately so additional testing can take place.

** END OF APPENDIX A **

Division 03 – CONCRETE

CONCRETE FORMING Section 03 11 00

1. **GENERAL**
   A. RELATED DOCUMENTS AND DESCRIPTION OF WORK
      1. This section covers the furnishing and installing and removing of forms for cast-in-place concrete work as shown and noted on the drawings and as specified. The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
   B. CODES:
      1. Except as modified by the requirements specified herein or the details on the drawings, formwork shall conform to the "California Building Code" (CBC), current edition, Chapter 19, "Concrete".
   C. REFERENCES
      1. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference.
         a. American Concrete Institute (ACI).
         b. U.S. Department of Commerce Product Standard (PS).
         c. Western Wood Products Association (WWPA).
         d. West Coast Lumber Inspection Bureau (WCLIB).
   D. SUBMITTALS:
      1. Submittal procedures and quantities are specified in Division 1.
      2. Product Data
         a. Submit manufacturer's specifications for form ties, spreaders and coating for review.

2. **PRODUCTS**
   A. MATERIALS
      1. Forms for Unexposed Concrete: Form concrete surfaces which will not be exposed in the finished structure with plywood, lumber, metal or other acceptable material.
         a. Lumber shall be standard or better grade Douglas fir, in accordance with WCLIB "Standard Grading Rules 1981" or WWPA "Western Lumber Grading Rules 80". Boards shall be surfaced on at least 2 edges and one side for a tight fit.
         b. Plywood shall be B-B Plyform, Class I exterior grade in accordance with PS1-5/8" minimum thickness for 12" stud spacing and ¾" minimum thickness for 6" stud spacing.
      B. Forms for Exposed Concrete: Form concrete surfaces which will be exposed in the finish structure with plywood or plastic forms.
      1. Plywood shall be High Density Overlay Plyform, Class 1 exterior grade in accordance with PS1-5/8" minimum thickness for 12" stud spacing and ¾" minimum thickness for 16" stud spacing. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members.
      C. Framing, Studding and Bracing: "Standard" or "Construction" grade Douglas fir, rough or S4S, conforming to the WCLIB "Standard Grading Rules 1981" or WWPA "Western Lumber Grading Rules 80".
      D. Form Ties and Spreaders: Standard metal form clamp assembly, of type acting as spreaders and leaving no metal within 1" of concrete face. Spreader cones shall not exceed 1" in diameter unless otherwise noted. Inner tie rod shall be left in concrete when forms are removed. Wire ties or wood spreaders will not be permitted. Form accessories shall be commercially manufactured type.

E. Form Coating: Non-grain raising and non-staining type that will not leave residual matter on surface of concrete or adversely affect proper bonding of subsequent application of other material applied to concrete surface. Coatings containing mineral oils or other non-drying ingredients will not be permitted. Form coating for use with form liners shall be of type recommended by form liner manufacturer. Form coating for color concrete shall be of type recommended by color manufacturer.

F. Nails: Common wire, steel.

G. Vapor Barrier:

1. General: Moistop Ultra 10 manufactured by the Fortifiber Building Systems Group.
2. Alternate Manufacturers: Comparable products manufactured by Stego Industries, LLC, or accepted equal.
3. Joint Tape: As recommended by manufacturer.

3. EXECUTION

A. DESIGN OF FORMWORK AND SHORING

1. The engineering and construction of all formwork, shoring, and bracing shall be carried out by and under the direction of the Trade Contractor, and he shall be held responsible for the engineering, construction, maintenance, and safety of all formwork during the entire construction period.
2. The formwork shall be designed for the loads and lateral pressures outlined in Part 3, Section 102, of ACI 347, and lateral forces as specified by the current edition of the California Building Code and updates.
3. Provide and install shores and centering for the work, constructed to required shape, size, and form, well braced and made rigid and capable of supporting and sustaining the loads imposed. Leave shores and centering in place until the concrete is sufficiently set to safely carry its own weight and added loads of construction.

B. CONSTRUCTION

1. Earth Forms: Earth forms may be used for footings only where the soil is firm and stable and the concrete will not be exposed to view. Where earth forms are to be used, excavations shall be cut neat and accurately to size for placing of concrete directly against the excavation. Construct wood edge strips at each side of trench at top to secure reinforcing and prevent trench from sloughing. Form sides of footings where earth sloughs. Earth forms shall be tamped firm and cleaned of all debris and loose material before depositing concrete.
2. Wood Forms: Construct forms of sound material to the correct shape and dimensions, mortar tight, and of sufficient strength, and so braced and tied together that the movement of men, equipment, materials, or placing and vibrating the concrete will not throw them out of exact shape under all imposed loads. They shall be so constructed that they may be easily removed without damage to the concrete. Before concrete is placed in forms, the horizontal and vertical position of the form shall be carefully verified and all inaccuracies corrected. All wedging and bracing shall be completed in advance of placing of concrete. Board forms having joints opened by shrinkage of the wood shall be swelled until closed by wetting before concrete is placed. Seal plywood and other wood surfaces not subject to shrinkage against absorbtion by commercial oil or sealer, or factory applied non-absorptive liner. Utilize form coating per color manufacturer's written literature for color concrete.
3. Framing bracing, supporting members, and centering shall be of ample size and strength to safely carry, without deflection, all dead and live loads to which forms may be subjected, and shall be spaced sufficiently close to prevent any bulging or

sagging of forms. Concrete out of line, level, or plumb will be cause for rejection of the whole work affected.

4. Tolerances: Formwork shall be so constructed as to ensure that the concrete surfaces will conform to the tolerances of Section 203.1, ACI 347. Camber the formwork to compensate for anticipated deflections in the formwork due to weight and pressure of the fresh concrete and construction loads.
5. Chamfered Corners: All exposed corners shall be chamfered ¾", unless noted otherwise on drawings. Provide molding in forms for all chamfering required.
6. Form Ties: Ties shall be of sufficient strength and used in sufficient quantities to prevent spreading of the forms. Ties shall be placed at least 1" away from the finished surface of the concrete and equally spaced when exposed to view.
7. Steel Forms: When steel forms are coated to prevent bond with concrete, it shall be done prior to placing of the reinforcing steel. Do not allow excess material to stand in puddles in the forms or allow it to come in contact with concrete against which fresh concrete will be placed.
8. Joints: Construction joints, isolation joints, shrinkage control joints and expansion joints shall be installed as approved. Location of construction joints shall be coordinated with and reviewed in advance of concrete pouring.
9. Embedded Piping and Rough Hardware:
   a. The Trade Contractor shall afford access to every tradesman who is required to fasten his work to that of the Trade Contractor, or who is required to insert therein any piping, box, bolt, anchor, insert sleeves or other rough hardware, with every facility for setting the same accurately in the forms.
   b. Conduits or pipes shall be so located as not to reduce the strength of the construction and in no case shall be placed in a slab less than 3-1/2 inches in thickness except for local off-sets. No conduit buried in a concrete slab shall have an outside diameter greater than 33 percent of the thickness of the slab, and no conduit shall be placed under slab reinforcing steel, except for slab mesh. No conduits or pipes shall be placed in structural slabs or grade beams without written approval from the City.
   c. Coating of Forms: Thoroughly clean forms and coat with specified form coating before each use. Do not reuse any form for exposed work which cannot be reconditioned to "like new" condition. Apply form coating to all forms in accordance with the manufacturer's specifications. Apply form coating to all forms before placing reinforcing steel. Where as cast finishes are required, do not apply materials which will impart a stain to concrete. Where the finished surface is required to be plastered, the material applied to form surfaces shall be compatible with type of plaster to be used. If plaster is applied over concrete surfaces, use a bond breaker. Utilize form coating per color manufacturer's written literature for color concrete.
   d. Inspection: Prior to placing of concrete, and after placement of reinforcing steel in the forms, provide notification so that proper inspection can be made. Such notification shall be made at least two working days in advance of placing concrete.
   e. Rejection of Defective Work: Any movement or bellying of forms during construction or variations in excess of the tolerances specified will be considered just cause for the removal of such forms and, in addition, the concrete work so affected. Reconstruction of forms, new concrete and any required reinforcing steel shall be furnished at no additional cost to the Owner.
10. Vapor Barriers:
    a. General: Install under interior slabs on grade and where shown. Lap joints minimum 6 inches and seal watertight.
    b. Penetrations: Seal watertight; repair penetrations and damage with vapor barrier material and lapped minimum 6 inches over area and sealed with joint tape. Protect from damage due to forming operations.

C, REMOVAL OF FORMS

1. Formwork for stem walls and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations, particularly when form ties will be bent by the removal operations, but not sooner than 24 hours after placing concrete.
2. Whenever the formwork is removed during the curing period, the exposed concrete shall be cured by one of the methods specified in Section 03 30 00.
3. Use softwood wedges to release form faces from concrete. Do not pry with metal tool.
4. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

END OF SECTION

REINFORCING STEEL Section 03 20 00

1. GENERAL

A. RELATED DOCUMENTS AND DESCRIPTION OF WORK
   1. This section covers the furnishing and installing of reinforcing steel for cast-in-place-concrete work as shown and noted on the drawings and as specified. The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

B. CODES
   1. Except as modified by the requirements specified herein and/or the details on the drawings, concrete reinforcing work shall conform to the "California Building Code, current edition (CBC)", Chapter 19, "Concrete".

C. REFERENCES
   1. The editions of the specifications and standards referenced herein, published by the following organizations, apply to other work only to the extent specified by the reference:
      a. American Concrete Institute (ACI).
      b. American Society for Testing and Materials (ASTM).
      c. Concrete Reinforcing Steel Institute (CRSI).
      d. American Welding Society (AWS).

D. SUBMITTALS
   1. Submittal procedures and quantities are specified in Division 1.
   2. Shop Drawings: Shop and placement drawings of all reinforcing shall be reviewed prior to fabrication.
      a. Placement drawings shall show the locations and spacing of reinforcing in the various parts of the structure with details as required, all in accordance with ACI 315. Cutting and bending lists submitted without placement drawings will be returned without review as incomplete. Placement drawings shall be complete so that placement of the reinforcing may proceed without reference to the design drawings.
      b. Review shall not act to relieve the Trade Contractor from responsibility for accuracy of the fabrication details and placing diagrams. Dimensions and locations shall be verified prior to the preparation of shop drawings.
      c. No work shall be done except from reviewed drawings which must be kept at all work locations. The Trade Contractor shall provide all reinforcing as noted on the engineering drawings.
      d. If there is a discrepancy between the shop drawings and the engineering drawings, the engineering drawings will take precedence.
   3. Product Data: Mill affidavits, stating the grades and physical and chemical properties of the reinforcing steel, and conformance with ASTM Specifications, shall be submitted before delivery of the steel to the job site.

E. DELIVERY AND STORAGE
   1. Delivery: Deliver reinforcement bundled and tagged to identify placement and certify testing.
   2. Reinforcing steel shall be transported to the building site, stored and covered in a manner which will insure that no damage shall occur to it from moisture, dirt, grease, or any other cause that might impair bond to concrete. A sufficient supply of approved reinforcing steel shall be stored on the building site at all times to insure that there will be no delay of the work. Identification of steel shall be maintained after bundles are broken.

F. COORDINATION
   1. Trade Contractor shall check architectural, structural, mechanical, and electrical drawings for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, block outs, and any other items which are required to be cased in concrete, and shall make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

2. PRODUCTS

A. MATERIALS

1. Reinforcing Bars: New, deformed, billet steel bars, conforming to ASTM A 615 Grade 60 unless otherwise shown on the drawings. Deliver bars new and free from rust and mill scale in original bundles with mill tags intact.
2. Accessories: Reinforcement accessories, consisting of spacers, chairs, ties, and similar items shall be provided as required for spacing, assembling, and supporting reinforcement in place. Accessories shall be galvanized steel or approved plastic accessories, conforming to the applicable requirements of the CRSI Standards hereinbefore specified.
3. Tie Wire: Tie wire for reinforcement shall be #16 gauge or heavier, where noted or specified, black or galvanized steel wire, conforming to ASTM A 82.

3. EXECUTION

A. FABRICATION

1. Fabrication of steel reinforcement shall be in accordance with the details shown on the drawings. Where specific details are not shown or noted, comply with the applicable requirements of CBC and ACI 315 hereinbefore specified.
2. Bars shall be accurately bent, cut and placed as indicated on the drawings. Bars shall be bent cold; heating of bars will not be permitted. Bars shall not be bent or straightened in any manner that will injure the material. Bars shall not be field bent.

B. PLACING

1. General: Reinforcing steel shall be placed in accordance with the drawings and the applicable requirements of the "Codes and Standards" hereinbefore specified. Install reinforcement accurately and securely against movement, particularly under the weight of workmen and the placement of concrete.
2. Reinforcing Supports: Bars shall be supported on metal chairs or spacers on metal hangers, accurately placed and securely fastened to steel reinforcement in place. Support legs of accessories in forms without embedding in form surface. Spacing of chairs and accessories shall conform to CRSI's "Recommended Practice for Placing Bar Supports". No wood will be permitted inside forms. Precast concrete cubes may be used to support footing and slab on grade reinforcing. Use of "hook and pull" method for slab on grade reinforcing is prohibited.
3. Placing and Tying: All reinforcing shall be set in place, spaced, and rigidly and securely tied or wired with #16 gauge steel tie wire at all splices and at crossing points and intersections in the position shown, or as directed. Point ends of wire away from forms.
4. Spacing: Bars shall be spaced as indicated on the drawings. For parallel bars, where spacing is not shown, the minimum clear spacing shall not be less than the nominal bar diameter, or 1-inch, or 1-1/3 times the maximum size aggregate, whichever is less. The clear distance limitations above also apply between the bars being spliced at a contact lap splice and adjacent bars.
5. Splices: Use Class B splices as defined in ACI 318 unless detailed locations are given for these splices on the design drawings. Stagger lapped splices by the required lap splice length minimum. Wherever possible, splices of adjacent bars shall be staggered.
6. Dowels: Dowels shall be tied securely in place before concrete is deposited. In the event there are not bars in position to which dowels may be tied, No. 3 dowel minimum shall be added to provide proper support and anchorage. Bending of dowels after placement of concrete will not be permitted. Dowels extended for future construction shall be protected from weather exposure and/or as shown on the drawings. Compliance with safety law requirements for extended dowels is also required.
7. Cleaning: Reinforcement, at time of pour, shall be free of coatings that would impair bond to concrete.
8. Welding: Welding of reinforcing steel is not permitted.

C. TESTING AND INSPECTION

1. Special inspection by a registered Deputy Inspector for all reinforcing steel as stated in structural drawings. Trade Contractor shall provide notification to City at least two working days ahead of each concrete placement, and no concrete shall be placed until all reinforcing steel has been installed by the Trade Contractor and approved by all required inspectors. All

reinforcing shall be complete in every way by the end of the working day prior to concrete placing. Testing and inspections are specified in Division 1.

D. DEFECTIVE WORK
   1. Defective work shall be removed and replaced by the Trade Contractor at no additional cost to the Owner. The examples of reinforcing steel work which will be considered defective shall include, but not be limited to the following:
      a. Bars with kinks or bends not shown on drawings.
      b. Bars injured due to bending or straightening.
      c. Bars heated for bending.
      d. Reinforcement not placed in accordance with the drawings or specifications.

END OF SECTION

CAST-IN-PLACE CONCRETE Section 03 30 00

1. GENERAL

A. RELATED DOCUMENTS AND DESCRIPTION OF WORK
   1. This section covers the furnishing and installing of cast-in-place concrete work attached and within the building as shown and noted on the drawings and as specified. The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

B. CODES
   1. Except as modified by the requirements specified herein and/or the details on the drawings, concrete work shall conform to the "California Building Code, current edition (CBC)", Chapter 19, "Concrete".

C. REFERENCES
   1. The latest editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference:
      a. American Concrete Institute (ACI).
      b. American Society for Testing and Materials (ASTM).

D. SUBMITTALS: Submittal procedures and quantities are specified in Division 1.
   1. Product Data
      a. Submit certificates of compliance for Portland cement.
      b. Submit manufacturer's technical literature for admixtures, curing compounds, expansion joint filler, sealer and chemical hardener.
      c. Submit concrete mix designs, stamped and signed by a licensed California Civil Engineer.
      d. Copies of calcium chloride test results for concrete slab vapor emissions as required/described in subsequent sections will be submitted to the Owner and General Contractor. Tests shall be performed by an independent testing agency, paid for by the General Contractor, and in conformance with ASTM F1869 (moisture) and ASTM F710 (alkalinity). Should test results indicate either moisture (greater than 5 lbs per 1,000 SF per 24 hours) or alkalinity results unacceptable with the specified product manufacturer's requirements, remedial sealing or other action shall be performed by the Trade Contractor in a manner acceptable to the flooring manufacturer so as to not void the warranty and at no cost to the Owner.

E. LABORATORY TESTS AND MIX DESIGNS
   1. General: Compression tests of concrete shall be performed by a qualified testing laboratory in accordance with Section 01 45 23, Testing and Inspection Services. Mill tests and manufacturer's certification of compliance with ASTM Specifications shall be submitted to the Inspector in lieu of testing of cement and aggregate analysis. Contractor shall notify City and testing laboratory 24 hours in advance of placement.
   2. Compression Tests: See Division 1, Testing and Inspection.
   3. Mix designs shall be the responsibility of the Trade Contractor.
      a. Determine mix designs to fulfill the specified requirements for strength, aggregate size and workability of concrete, and such designs shall be used in proportioning all structural concrete. Mix designs shall be submitted for review by City.
      b. Mix designs shall be made in accordance with ACI 211.1 for regular concrete.
      c. Cover and clear distances between reinforcing bars shown on the drawings shall be considered in determining the aggregate size for mix designs and may result in an aggregate size smaller than the maximum aggregate size allowed elsewhere in this specification.
      d. Trade Contractor shall provide a list of where the mix designs are to be used and curing method to be used concurrently with the designs for review.
      e. Review shall not be considered unqualified approval, and shall not relieve the Trade Contractor of his responsibility to furnish concrete of proper consistency and specified strengths.

f. All interior slabs on grade shall be tested for vapor emissions prior to installation of flooring finishes as described in subsequent sections. Three tests for first 1000 s.f. and one test per 1000 s.f. thereafter.

F. PROPERTIES AND PROPORTIONS

1. Concrete
   a. Minimum concrete strengths at 28 days shall be 4,500 psi for all concrete unless otherwise indicated on the structural drawings.
   b. Slumps: Shall be 4" +/- 1" typical.
   c. Maximum Size Aggregate: Shall be 1" unless a smaller maximum aggregate size is approved by the City. Aggregate shall be well graded. In no case shall the maximum aggregate size used exceed 20% of a member's thickness, nor shall it exceed 3/4 of the clear spacing between reinforcing.
   d. All concrete shall have a maximum Water/Cement Ratio of 0.45. (Exceeding 0.45 is not allowed).
2. Grout: One part Portland cement and two parts fine aggregate by volume. Grout shall be of a consistency suitable for the intended purpose and shall be used immediately after mixing. Grout used under minor bearing plates shall be "drypack" and shall be rammed into place. Small quantities of grout may be mixed by hand, but any grout requiring one-half sack of cement, or more, per batch shall be machine mixed. Grout shall produce a 2000 psi compression strength in 28 days unless otherwise noted.
3. Non-Shrink Grout: Non-Shrink Non-Metallic Grout shall be pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
4. Quick setting hydraulic cement: Shall be one of the following:
   a. "Por-Rok" as manufactured by Hallemite/Lehn and Fink.
   b. "Thorogrip" as manufactured by Thoro System Products.
   c. Grout shall produce a 7000 psi compression strength in 28 days at column base plates unless otherwise indicated on structural drawings.

G. COORDINATION
1. Trade Contractor shall check architectural, structural, mechanical, and electrical drawings for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, blockouts, and any other items which are required to be cased in concrete, and shall verify their placement before placing of concrete.

H. TOLERANCES
1. All tolerances shall be as defined in ACI 117 and as specified.
2. Classification shall be per General Building: Cast-in-Place, ACI 117, Section 4.0, unless noted otherwise.

2. PRODUCTS

A. MATERIALS
1. Portland Cement: ASTM C150, Type II/V unless otherwise noted on drawings. Type II/V cement shall meet the strength requirements of Type I cement. Compressive strength per drawings.
2. Pozzolan: ASTM C 618, Type F or C. Limit use of pozzolan to not more than 15% of cement content by weight.
3. Regular Weight Concrete Aggregates: ASTM C 33. In lieu of the use of ASTM C 227 to determine alkali reactivity of the aggregates as specified therein, the alkali reactivity shall be "innocuous" as determined by ASTM C 289. All aggregate to be slip resistive.
   a. Fine aggregate shall be washed clean, shall be uniformly screen graded, and shall contain not more than 2% by weight of deleterious materials such as shale, shist, alkali, clay lumps, earth, loam, mica or similar materials. Fine aggregate shall be graded uniformly from fine to coarse.
   b. Coarse aggregate shall consist of clean, hard, crushed rock or washed gravel, free from organic materials or soft or friable materials and shall not contain more than 2% by weight of shale or cherty material and not more than 15% by weight of elongated fragments.

c. Grading of combined aggregate shall be well-distributed.

4. Admixtures, if used: ASTM C 494, of a type that increases workability and reduces water demand of concrete, but will not increase shrinkage. Admixture shall be subject to approval as to type and amount used. Admixtures shall contain not more than one percent chloride ions. Calcium chloride shall not be used. Super plasticizer shall be Darex "WRDA-19" by W. R. Grace Co. or prior approved equal-subject to approval at mix review.
5. Air-Entraining Agent: ASTM C 260, subject to approval.
6. Water Used in Mixing Concrete: Potable, clean and free from deleterious amounts of acid, alkalis, organic or other materials.
7. Curing Membrane: Non-staining paper conforming to ASTM C 171, or 6 mil thick polyethylene film.
8. Expansion Joint Filler: Premolded, non-extruded, resilient type, non-bitumous, 1/4" to 1/2" thick unless otherwise noted on drawings, conforming to ASTM D1751.
9. Expansion Joint Sealing Compound: Expansion joint sealant and backer rod shall be in accordance with Section 079200.
10. Vapor Retarder: Vapor retarder under interior concrete slab-on-grade shall be 10 mil polyethylene membrane.
11. Sand for use with vapor barrier under concrete slab-on-grade shall be washed fine aggregate conforming to ASTM Test Standard D2419 "Sand Equivalency", with a Sand Equivalency (SE) value of greater than 30.
12. Sealer: Sealer for floors shall be one of the following acrylic resin compounds designed to seal and dust-proof concrete floors. (Do not use sealer on walls receiving waterproofing membrane.)
    a. Burke Co.: "Spartan-Seal"
    b. Nox-Crete: "Bro-Cure"
    c. Sonneborn-Contech: "Kure-N-Seal"
13. Chemical Hardener: Chemical hardener for floors shall be one of the following colorless aqueous solution containing a blend of magnesium flousilicate and zinc flousilicate combined with a wetting agent, containing not less than 2 lbs. of flousilicates per gallon:
    a. "Surfhard"; Euclid Chemical Company
    b. "Lapidolith"; Sonneborne-Contech
    c. "Burk-O-Lith"; The Burke Company
14. Control Joints: Round top edges of joint slightly with joinery tool to create "tooled joint."
15. White Polyethylene Sheeting: (do not use clear). Sheeting shall be a minimum of 3 mil (0.004) in thickness per ASTM C171. Units shall be lapped at least 18 inches.

B. MIXING

1. Ready mixed concrete shall be used and shall be mixed and transported in accordance with ASTM C 94.
2. Re-tempering: Concrete shall be mixed only in quantities for immediate use. Concrete which has not been placed 1 1/2 hours after the water has been added at the batch plant shall be rejected. The concrete shall be discarded off the site and disposed of by the Trade Contractor.
3. Water may be added to concrete at the site only if the total amount of water permitted to be added while remaining within the maximum water-cement ratio is greater than the total amount added at the plant. The mix ticket must clearly note both the maximum amount and the amount added at the plant as well as the maximum amount of water to be added at the site. This amount shall not be exceeded. The water must be incorporated by additional mixing equal to at least half of the total mixing required.
4. Unacceptable vapor emissions may be caused by excessive moisture from too high water/cement ratio in the concrete mix or curing practices or admixtures which prevent proper hydration by "rushing" the curing process.
5. Newly placed interior slabs on grade tested and found to have a moisture emission rate higher than that allowed by the flooring material manufacturer, but not more than 5.0 pounds/1000 square feet/24 hours, shall require that the City be notified and specific instructions will be prepared.

3. EXECUTION

A. CONVEYING AND PLACING CONCRETE

1. Notification: Notify the City at least two working days in advance of placing concrete.
2. Preparation Before Placing:
   a. Hardened concrete and foreign materials shall be removed from the inner surfaces of the conveying equipment.
   b. Formwork shall have been completed; excess water shall have been removed; reinforcement and anchor bolts shall have been secured in place; expansion joint material, anchors, and other embedded items shall have been positioned; and the entire preparation shall have been approved on the day prior to the placing of concrete.
   c. Semi-porous subgrades shall be sprinkled sufficiently to eliminate suction and extremely porous subgrades shall be sealed in an approved manner.
   d. Before placing of any concrete, all forms shall be thoroughly cleaned, washed out with water, and made tight. Before reinforcing steel is placed on top of and/or adjacent to forms which have been sealed, the surface sealer shall be wiped off so that none may be tracked over, or in any other way come in contact with the reinforcing steel.
   e. All incrustation shall be removed from forms and reinforcing steel at construction joints.
   f. Depositing against other concrete. Before depositing new concrete on or against hardened concrete, re-tighten forms and roughen surface of hardened concrete as follows. Concrete which has been placed longer than 3-1/2 hours, but less than 6-1/2 hours, prepare by removing all laitance from concrete by wire brushing. Concrete which has been placed longer than 6-1/2 hours, prepare by sand blasting to roughen surfaces to ¼" minimum. Thoroughly clean of foreign matter and laitance, and moisten with water.
3. Placement
   a. Place all concrete in accordance with ACI 318, Chapter 5.
   b. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients.
   c. Conveying equipment shall be of size and design to ensure a continuous flow of concrete at the delivery end.
   d. Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams, planes, or weakness within the section, or visible pour lines in the finish surface.
   e. All concrete shall be consolidated by vibration, so that the concrete is thoroughly worked around the reinforcement, around the embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. All mechanical vibrators shall have a minimum frequency of 7,000 rpm and shall be operated by competent workmen. Over-vibration and use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at many points, from 18 to 30 inches apart, for 5 to 15 seconds duration. A spare vibrator shall be kept on the job site during all concrete placing operations. Particular care shall be given at exposed concrete surfaces.
   f. Inspections: Continuous inspection required during placement of concrete.
   g. Hot Weather Requirements:
      i. All concrete placed shall be in compliance with ACI 305R.
      ii. The maximum placing temperature of the deposited concrete shall be 90 degrees F.
      iii. If weather conditions would cause the concrete temperature, when deposited, to exceed 90 degrees F, the mix shall be cooled by wetting the aggregate or by other appropriate methods. Revise mix design as necessary.
4. Flatwork:
   a. Edge forms and intermediate screed strips shall be set accurately to produce the designed elevations and contours in the finished surface, and shall be sufficiently strong to support vibrating bridge screeds or roller pipe screeds if the nature of the finish specified requires the use of such equipment. The concrete surface shall be aligned to the contours of screed strips by the use of strike-off templates or approved compacting type screeds.

b. Joints in slabs on grade shall be located and detailed as indicated in the project drawings. Unless otherwise noted, slab joints should be placed so as not to create an area of over 144 square feet, keeping the shape of the area as close to square as possible. Contractor shall notify City on location of all other required joints not shown on drawings before reinforcing is placed. Contractor shall install sealant as referenced in Division 7 in all joints.
c. Concrete slabs shall be thoroughly consolidated. Internal vibration shall be used along the bulkheads of slabs on grade. Consolidation of slabs and floors shall be obtained with vibrating bridge screeds, roller pipe screeds, or other approved means. Concrete to be consolidated shall be as dry as practicable and the surfaces thereof shall not be manipulated prior to the finishing operations.
d. Slabs on grade and topping slabs shall slope uniform to grades and elevation where shown on the drawings, locally slope to drains. Concrete shall slope a minimum 2% away from building.

B. REPAIR OF SURFACE DEFECTS
1. Repair of Surface Defects: All form tie holes shall be filled and repairable defective areas patched immediately after the forms have been removed. Remove fins and burrs.
2. Removal: After forms have been removed, any concrete which is not formed as shown on the plans, or which is out of alignment or level beyond required tolerances shall be removed and replaced at no additional cost to the Owner. Defective surfaces may be repaired and patched in accordance with the following procedure. All conditions requiring patches and completed patches will be inspected. Patches disapproved as not restoring the quality and appearance of the surrounding work shall be removed and replaced so as to match the surrounding work.
3. Repair Procedure
a. All honeycombed and other defective concrete shall be removed to sound concrete, but in no case to a depth of less than 1 inch. The area to be patched and an area of at least 6 inches wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bond of neat Portland cement and water, and, if permitted, some fine sand passing a No. 30 sieve, shall be mixed to the consistency of thick cream and shall then be well brushed into the surface. Other concrete bonding agents may be used when approved.
b. The patching mixture shall be made of the same material and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2-1/2 parts sand by damp loose volume. White Portland cement shall be substituted for a part of the gray Portland cement on exposed concrete in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch.
c. The quantity of mixing water shall be no more than necessary for handling and placing. The patching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.
d. After surface water has evaporated from the areas to be patched, the bond coat shall be well brushed into the surface. When the bond coat begins to lose the water sheen, the pre-mixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface. To permit initial shrinkage, it shall be left undisturbed for at least one hour before being finally finished. The patched area shall be kept damp for seven days.
4. Prior to proceeding with any patch work, the Trade Contractor is responsible for establishing trial patch areas to develop the approved patching color and the method of applying and surface-texturing the patching material.

C. CONCRETE FINISHES
1. Finishes for Formed Surfaces:
a. As-cast Surfaces: After surface defects have been repaired, as specified, concrete shall be left with finish imparted by forms.
2. Finishes for Flatwork:

a. Provide Troweled Finish for Interior Exposed Concrete Floors: Surface shall be finished first with impact power floats, as specified above where applicable, then with power trowels, and finally with hand trowels. First troweling after power floating shall be done by a power trowel and shall produce a smooth surface which is relatively free of defects but which may still contain some trowel marks. Additional trowelings shall be done by hand after surface has hardened sufficiently. Final troweling shall be done when a ringing sound is produced as trowel is moved over surface. Surface shall be thoroughly consolidated by the hand troweling operations. Finished surface shall be free of any trowel marks and shall be uniform in texture and appearance. On surfaces intended to support floor covering, any defects of sufficient magnitude to show through floor covering shall be removed by grinding.
b. Provide the same finish on the new concrete slab as the existing slab when the two join.
c. Edge and Joint Finish: Use standard tools to produce rounded edge corners and intermediate line scoring.
d. Mark-Off Lines: Mark-off lines shall be formed with curved edging tool, neat and true to line, uniform throughout. Conform to markings shown on drawings.
e. Sealer: Remove all dirt, dust, oil, grease, asphalt and other foreign matter. Cleanse with caustics and detergents as necessary. Apply sealer in two coats using an ordinary garden sprayer. Apply first coat evenly and uniformly as soon as possible after final finishing. Apply second coat when all trades have completed work and structure is ready for occupancy.

3. Chemical Hardener: Apply chemical hardeners in accordance with manufacturer's printed instruction. After final coat of chemical hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

D. PROTECTION AND CURING

1. General: Freshly deposited concrete for interior slabs - on - grade, shall be protected from premature drying and excessively hot or cold temperatures, and shall be maintained without drying at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete.
2. Initial Curing: Initial curing shall immediately follow the finishing operation.
   a. Fog Spray: Immediately after the finishing operations have been completed and marring of the concrete will not occur, the entire surface of the newly placed concrete shall be fog sprayed with water and then covered with white polyethylene while still moist. A one inch cover of sand shall be installed and remain for five (5) days over the polyethylene to hold it in place.
3. Final Curing: Immediately following the initial curing and before the concrete has dried, additional curing shall be accomplished by the following materials.
   a. Continuing the method used in initial curing, the Trade Contractor shall cure the slab an additional 5 days by keeping it polyethylene covered in accordance with ACI 301 procedures. CONTRACTOR TO PROVIDE TIME IN PROJECT SCHEDULE FOR PROPER CURING PER THIS SPECIFICATION.
4. Duration of Curing: The final curing shall continue until the cumulative number of days or fractions thereof, not necessarily consecutive, during which temperature of the air in contact with the concrete is not less than 50 degrees F has totaled five days. If high early strength of concrete has been used, the final curing shall continue for a total of three days. Rapid drying at the end of the curing period shall be prevented. The concrete shall not be left exposed for more than 1/2 hour between stages of curing or during the curing period. Failure to provide sufficient cover material to adequately take care of both curing and other requirements shall be cause for immediate suspension of concrete operations.
5. Formed Surfaces: Steel forms heated by the sun and all wood forms in contact with the concrete during the final curing period shall be kept wet. If forms are to be removed during the curing period, one of the above curing materials or methods shall be employed immediately. Such curing shall be continued for the remainder of the curing period.
6. Protection from Mechanical Injury: During the curing period, the concrete shall be protected from damaging mechanical disturbances, particularly load stresses, heavy shock, and

excessive vibration. All finished concrete surfaces shall be protected from damage caused by construction equipment, materials, or methods, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete. The slab is to be kept undisturbed with no material or equipment on the slab for 12 consecutive days after placement.

E. SLAB JOINTS
   1. Construction Joints: Construction joints in concrete slabs shall coincide with planned control joint pattern in areas with control joints. Joints in slab on ground shall be formed and keyed.
   2. Control Joints: (Weakened Plane Joints): Form in slabs as shown on the drawings, with spacing not to exceed 12-feet on center. After initial set occurs, round top edges of joint slightly with joinery tool to create "tooled joint".
   3. Expansion Joints with Sealant: Expansion joint filler shall be full depth of concrete. Provide expansion joints with sealant typically between exterior concrete slabs on ground and building structure walls and columns, and where shown. Note: Bondbreaker tape will not be required if specific expansion joint filler with peel-off edge is used throughout. For joint sealant refer to Division 7, SEALANTS.

F. DEFECTIVE WORK
   1. Defective concrete work shall be removed and replaced at Trade Contractor's expense.

END OF SECTION

POLISHED CONCRETE FINISH Section 03 35 43

1. GENERAL:

A. SUMMARY: Provide Polished Concrete Finish, as shown and specified per Contract Documents.

B. REFERENCES:

1. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   b. ASTM C779: Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
   c. ASTM E430: Standard Test Methods for Measurement of Gloss of High-Gloss Surfaces by Abridged Goniophotometry.
   d. ASTM E1155: Standard Test Method for Determining Floor Flatness and Levelness using the F number system.
   e. ASTM F609: Standard Test Method for Using a Horizontal Pull Slipmeter (HPS).
   f. ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
   g. ASTM F1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
   h. ASTM F2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
   i. ASTM E1155: Standard Test Method for Determining Floor Flatness and Levelness using the F number system.
2. Concrete Polishing Association of America (CPAA): Standard specifications, concrete mix and placement guidelines, aggregate classifications and surface finish levels.
3. National Floor Safety Institute (NFSI): B101.0 - Walkway Surface Auditing Procedure for the Measurement of Walkway Slip Resistance.

C. SUBMITTALS:

1. General: Submit product data.
2. Samples:
   a. General: Submit manufacturers standard liquid dye colors.
   b. Aggregate: Submit range of color aggregate.
3. Test Reports Submit NFSI certification that polished floor surfaces achieve a static coefficient of friction of not less than 0.5.
4. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

D. QUALITY ASSURANCE:

1. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience; manufacturer approved. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
2. Pre-Installation Conference:
   a. General: Coordinate with Section 03 30 00 - CAST-IN-PLACE CONCRETE requirements.
   b. Attendees: Concrete finisher (including supervisor), concrete polisher (including supervisor), technical representative of liquid applied product manufacturer(s) and NFSI walkway auditor.
   c. Agenda: Review concrete mix designs, aggregate size and placement; coordinate depth of cut for grinding and examine procedures for ensuring quality of concrete finish.

2. PRODUCTS:

A. MATERIALS:

1. LEED Certification Requirements:
   a. VOC Materials Compliance:
      1. General: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory and the following:
      2. Stains and Finishes: Green Seal Standard GS-47.
2. Liquid Applied Products:
   a. General: Products manufactured by L. M. Scofield Company.
   b. Alternate Manufacturers: Comparable products manufactured by AmeriPolish, Inc., or approved equal.
   c. Liquid Densifier: Formula One Lithium Densifier - MP.
   d. Liquid Dye: Formula One Liquid Dye Concentrate, color selected by the City Representative.
   e. Polish Guard: Formula One Finish Coat

3. Aggregate: Decorative type, smooth 3/4 inch maximum aggregate size, as selected by City Representative. Provide each color and type selected from single source.
4. Accessories: Patching compound, grout material and protective covering per CPAA Standard specifications.

B. EQUIPMENT:
1. General: Field and edge grinding, polishing and burnishing equipment and products per CPAA Standard specifications, as required to achieve the specified finish level.

C. MIXES:
1. General: Refer to Section 03 30 00 - CAST-IN-PLACE CONCRETE; coordinate placement of selected aggregate sizes and types in mix.
2. Liquid Applied Products: Per manufacturers directions.
3. Aggregate: Coordinate placement of selected aggregate sizes and types in mix.

3. EXECUTION:

A. PREPARATION:
1. Environmental Requirements: Do not proceed when air, surface, or material temperatures are expected to fall below 40 degrees F within four (4) hours of expected application.
2. Examination:
   a. General: Examine conditions of work in place before beginning work; report defects.
   b. Concrete Strength: Verify concrete has reached a minimum 3,500 psi 28 day strength.
3. Measurements:
   a. General: Take field measurements; report variance between plan and field dimensions.
   b. Concrete Level Tolerance: Verify that concrete placement is of sufficient depth to match the level of other specified floor materials after grinding and polishing.
4. Protection: After completion of polishing, protect polished floors from subsequent construction activities with protective covering.
5. Delivery: Protect materials during handling and application to prevent damage or contamination.
6. Surface Preparation:
   a. General: Prepare and clean concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, paint splatter, and other contaminants incompatible with liquid applied products and polishing.
   b. Vapor Testing Concrete Floors:
      1. Alkalinity: ASTM F710; pH between 8 and 10.
      2. Moisture Vapor Transmission Rate: Per ASTM F1869; not more than 5 pounds per 1000 square feet in 24 hours.
      3. Relative Humidity: Per ASTM F2170; not more than 75 percent.
7. Mock-up: Provide a sample panel, in a location and size as directed by the City Representative. Use processes and techniques to be used on permanent work, including curing procedures. Show uniformity of exposed aggregate, sheen and color of cut and shine of floor surface and edges. Include samples of control, construction, and expansion joints in sample panels. Retain accepted sample panel through completion of work for use as a quality standard for finished work. Sample panel may become part of completed work with acceptance by the City Representative.

B. APPLICATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Grinding: Use bonded abrasives, in as many abrasive grits necessary to achieve an aggregate exposure of CPAA ClassC - Medium Aggregate (1/8 inch cut).
3. Polishing: Grind and polish concrete per ASTM E430 C - Medium High Reflectivity reading of 51 to 65 (CCPA Level 3 - Semi-Polished), matching accepted mock-up.

C. FIELD QUALITY CONTROL:
1. Static Coefficient of Friction: A reading of not less than 0.5 for level floor surfaces shall be achieved and documented, as determined by certified an NFSI walkway auditor using the NFSI walkway surface auditing procedure.

* * *

GYPSUM CEMENT UNDERLAYMENT Section 03 54 13

1. GENERAL:

A. SUMMARY: Provide Gypsum Cement Underlayment, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
C. SUBMITTALS:
   1. General: Submit product data and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE:
   1. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Gypsum Cement Underlayment:
      a. General: Acousti-Mat I manufactured by the Maxxon Corp.
      b. Alternate Manufacturers: Comparable products manufactured by Hacker Industries, Inc., or approved equal.
      c. Primer: Manufacturer's standard.
      d. Sealer: Recommended by manufacturer.
   2. Water: Potable; free of impurities and harmful contaminants.
B. MIXES:
   1. General: Per manufacturer's directions.

3. EXECUTION:

A. PREPARATION:
   1. Environmental Requirements: Do not install materials during inclement weather or when temperature falls below 40 Degrees F.
   2. Examination: Examine conditions of work in place before beginning work; report defects.
   3. Measurements: Take field measurements; report variance between plan and field dimensions.
   4. Protection: Protect adjacent surfaces during installation.
   5. Surface Preparation:
      a. General: Clean subfloors; patch and level depressions and other imperfections per manufacturer's directions.
      b. Leak Prevention: Fill cracks, holes and voids with a quick setting patching or caulking material.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Gypsum Cement Underlayment:
      a. Primer: Apply per manufacturers instructions.
      b. Application: Spread and float to a level smooth surface in a continuous operation, to thickness as shown.
      c. Tolerances: 1/8 inch in 10'-0" in any direction.
      d. Sealer: Apply per manufacturer's instructions.

* End Division 03 *

Division 04 – MASONRY

REINFORCED CONCRETE UNIT MASONRY — Section 04 22 00

1. GENERAL

A. RELATED DOCUMENTS AND DESCRIPTION OF WORK
   1. This section covers the furnishing and installing of concrete unit masonry work as shown and noted on the drawings and specified herein. The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

B. QUALITY ASSURANCE
   1. Codes: Except as modified by the requirements specified herein and/or the details on the drawings, all concrete unit masonry work shall conform to the "California Building Code, current edition (CBC)", Chapter 21, "Masonry".

C. REFERENCES
   1. The editions of the specifications and standards referenced herein, published by the following organizations, apply to the work only to the extent specified by the reference.
      a. American Concrete Institute (ACI).
      b. American Society for Testing and Materials (ASTM).

D. SUBMITTALS
   1. Submittal procedures and quantities are specified in Division 1.
   2. Samples: Submit representative samples of masonry units to be used on the job for approval. Trade Contractor shall construct in place a 4'x 8' mock up quality control field sample of masonry units for approval by City where exposed masonry wall finish is required by contract documents.
   3. Product Data: Furnish a notarized certificate of compliance identifying the cement used and stating that the cement complies with ASTM C150.

E. HANDLING AND STORAGE
   1. Immediately upon delivery to the site, masonry units shall be stacked undercover or otherwise protected from exposure to the weather and from contact with soil. Care shall be exercised in handling these items to avoid chipping and breakage and to protect them from damage. Use of damaged blocks will not be permitted. Units shall be stored on pallets or temporary wood floors off the ground and out of the way of other trades.

F. PROJECT CONDITIONS
   1. Do not lay masonry when the ambient temperature is below 40 degrees F or when it is likely that the ambient temperature will fall below 40 degrees F during, or within 24 hours after, masonry laying operations.

G. COORDINATION
   1. Locate dowel positions before concrete is placed so dowels match reinforcing steel in masonry. Furnish a dowel placing plan in addition to bar lists. Locate elevations for joint between concrete footing and masonry.
   2. Place bolts, anchors, drilled-in wedge anchors, metal attachments, nailing blocks and inserts required by other trades for attaching their work to masonry.

2. PRODUCTS

A. MATERIALS
   1. Concrete Masonry Units: Hollow load-bearing units, conforming to ASTM C90, Type 1 medium weight units, except that units shall have a maximum linear shrinkage of 0.06%. Block shall be:

a. Standard precision units 8" x 16" nominal face size, thickness as indicated. Strength shall be as indicated on Structural Drawings. Concealed units shall be standard block texture of standard gray color. Exposed units colors and textures shall be as indicated on Architectural Drawings.

2. Cement: Standard Type II Portland cement, conforming to ASTM C 150 Type II, low alkali.
3. Lime: Hydrated, conforming to ASTM C 207, Type S or quicklime conforming to ASTM C 5.
4. Mortar Sand: Natural sand, clean and graded, conforming to ASTM C 144, except not less than 3% shall pass No. 100 sieve.
   a. Ready Mix Mortar: Allowed as approved substitution conforming to ASTM C-1142 Standard Specification for Ready Mix Mortar for Unit Masonry. Color to be approved by City.
5. Aggregate for Masonry Grout: Pea gravel conforming to ASTM C 404 except graded with not more than 5% passing a No. 8 sieve and 100% passing 3/8-inch sieve size.
6. Sand for Grout: Washed, natural sand conforming to ASTM C33 and having hard, strong and durable particles evenly graded with 5% minimum passing #100 screen and which does not contain more than 2% by weight of such deleterious substances as clay lumps, shale, shist, alkali, mica, coated grains or soft flaky particles.
7. Water: Clean and free of deleterious amounts of acids, alkalis, or organic materials.
8. Lime Putty: Make from quicklime or hydrated lime. If from quicklime (other than pulverized (processed) quicklime) slake properly and screen through sieve of 16 meshes per linear inch. Before using, properly store and protect for not less than 10 days. If pulverized (processed) quicklime slake for at least 48-hours or until putty has cooled entirely. Putty must weigh at least 83 lbs. per cubic foot.
9. Anchors, Ties and Centering Devices: Factory fabricated from steel wire conforming to ASTM A82. Wire devices in all walls shall be formed from wire that has been zinc coated in accordance with ASTM A116, Class 1.
   a. Centering clips shall be formed from not lighter than 9 gauge wire. Clips shall be of a design that will prevent displacement of the reinforcing bars during the course of construction.
   b. Wire anchors for use with embedded slots or wire inserts shall be formed from not lighter than 9 gauge wire looped and closed.
10. Water: Fresh, clean and potable, and free from such amounts of mineral and organic substances as would adversely affect the hardening of cement mortar.
11. Reinforcing Steel: Furnish and install reinforcing steel for grouted concrete unit masonry in accordance with the requirements of Section 03 21 00.
    a. Horizontal reinforcing at mortar joints shall be per structural drawings.
12. Mortar: Mortar used in unit masonry construction shall be Type S.
13. Control Joint: Premolded Control Joint Strips: Styrene-butadiene rubber compound complying with ASTM D2000, Designation 2AA-805, designed to fit standard sash block and to maintain lateral stability in masonry wall.
14. Bond Breaker Strips: 15 lb. asphalt roofing felt per ASTM D226, Type I. Premolded control joint filler for masonry walls shall be styrene-butadiene rubber compound complying with ASTM D2000, with neoprene compound edge.
15. Water Repellents: See Section 07 19 00 for clear water repellents on exposed masonry above grade.

B. ASSEMBLY
   1. Concrete masonry unit assembly to have a minimum compressive strength (f'_m) equal to or greater than 1,500 psi unless otherwise noted in structural drawings.
   2. Grout: Coarse grout shall have a minimum of 2 parts pea gravel and shall be used in grout spaces 2" wide or more and in all filled cells. Grout shall have a compressive strength of 2,000 psi at 28 days.
   3. Mortar: Mortar shall be composed of one part Portland cement and 3-1/2 maximum parts of sand based on dry loose volumes and ¼ part lime putty or dry hydrated lime. Mortar shall have a compressive strength of 1800 psi at 28 days unless otherwise indicated on drawings. Mortar shall be custom colored as selected by City.

3. EXECUTION

A. WORKMANSHIP

1. All masonry shall be reinforced and shall be fully grouted unless otherwise noted in Structural Drawings.
2. Neatly remove damaged masonry and replace with new work to match adjoining masonry.
3. Walls: Lay plumb, level and to plane surface. Mortar joints straight, clean and uniform in thickness. Fully butter all end joints where masonry units are below grade. Butter and tool in weathered joints each side of masonry.

B. MIXING MORTAR AND GROUT

1. Mixing of Mortar: Place 1/2 required water and 1/2 required sand into rotating mixer, then all cement and remaining water, sand and lime. Admixtures shall be added in proportion and sequence as recommended by manufacturer.
   a. Lime shall be the last material added to the mix. Mix at least 3-minutes after all materials are in mixer. Equipment for mixing and handling mortar shall be of an approved type. Use mixer of at least one sack capacity. Hand mixing not allowed. Materials for mortar and grout shall be measured in suitable calibrated devices.
   b. Maintain mortar on boards to slump of 2-3/4 inches plus or minus ¼" using truncated cone 4" to 2" in diameter, 6" high. Retemper mortar only on boards by adding water within basin formed with mortar and carefully work mortar and water together. Dashing or pouring water over mortar, not permitted. Discard mortar that has become harsh and non-plastic. When mortar has been maintained plastic, it may be used up to but not more than 60 minutes after original mixing.
2. Mixing Grout: Use transit mixed grout with sufficient water added so slump is near maximum (approximately 11") without separation of aggregate and cement paste. Discard grout if not in final position by 2-1/2 hours after water is first added providing it is constantly rotated and grout remains in fluid condition. Move from mixer to place of final deposit as rapidly as practical by methods which prevent separation or loss of ingredients.
   a. Measure materials with accurately calibrated devices. Shovel measurements not allowed. Percentages are by volume and one 94 lb. sack of cement equals 1 cu.ft.
   b. Grout: Grout strength and slump shall be as indicated on project drawings: I part cement, 3 parts maximum of sand, 2 parts pea gravel.
   c. Pointing Mortar: 1 part white cement, 1/8 part lime putty, 1 part sand.

C. INSTALLATION

1. Laying Masonry Units: Where continuous inspection is indicated, do not install block or grout unless masonry inspector is present.
   a. Do not use oiled, greased, chipped, cracked or otherwise defective marked units.
   b. Remove dust and dirt from block surfaces before laying. Sandblast top of foundation to remove laitance from pores and expose the aggregate. Clean surface of all dust, dirt, organic matter, or debris before laying first course.
   c. Prior to receiving grout, cells shall be clean of all deleterious materials and obstructions. Remove overhanging mortar from inside cells.
   d. Lay block in running bond unless otherwise indicated on drawings.
   e. Minimum dimension of the grout spaces containing reinforcing steel shall be not less than 3-1/2 inches.
   f. All head joints shall be full shoved.
   g. All bond beam units shall be deep cut units. All bond beam units shall be of the same size, color, and layout pattern as the adjacent field units, but of a precision texture.
   h. Exposed joints to be tooled concave. Joints below grade and at walls to receive plaster shall be finished flush.
   i. Bolts: All bolts which are embedded in masonry shall be grouted in place with not less than 1-inch of grout or drypack between the bolt and the masonry as indicated on structural drawings.
   j. Make block cuts with carborundum wheel or masonry saw.
   k. Piping not allowed in block work unless shown on drawings.

l. Install necessary bracing and shoring true, rigid and strong enough to carry all dead and live loads without deflection. Do not backfill behind retaining wall unless wall is shored or has attained full strength. All reinforcing shall be fully embedded in grout. The thickness of the grout between masonry units and reinforcing shall be a minimum of ½".

m. Install reinforcement as indicated on the drawings. Provide ¾" clearance between bar and masonry. Furnish and install all required metal accessories to insure accurate alignment of reinforcement during grout placement. Horizontal reinforcement shall be placed only in bond beam units.

n. Control Joints: Provide control joints as shown on the drawings or as directed by the City. Control joints shall be continuous full height of walls. At bond beams control joints shall separate both block and grout, however, steel reinforcing shall be continuous. Hold control joint filler materials back from finished surface. Grout block cells solid each side of joint with No. 5 vertical reinforcing bar unless otherwise noted in drawings.

o. Monitor installation of concrete masonry units (CMU) to ensure proper seating for structural steel.

2. Low Lift Grout System:

a. This system includes placing reinforcing steel before or during construction of wall, pouring grout in lifts not to exceed 4'-0" tall as specified herein, unless cleanouts are provided as specified.

b. Place reinforcing steel accurately according to drawings and notes thereon. Hold vertical steel firmly in position. Use frames or other suitable devices to prevent movement or jarring while placing masonry. Place horizontal steel as work progresses. Lap steel at least 40 bar diameters unless noted otherwise on the structural drawings. Extend steel through points of stoppage to provide required lap. Horizontal steel may be wired temporarily above required position and tagged to indicate its location and vertically marked indicators maintained showing required location of horizontal bars. If doubt exists whether or not steel has been properly placed, use drill to locate same, or open masonry as required by City. Make repairs as directed.

c. After the laying of masonry units is completed, the cells cleaned, the reinforcing positioned, and inspection completed, the cleanouts shall be closed by inserting face shells of masonry units or covering the opening with forms. Face shell plugs shall be adequately braced to resist the pressure of the fluid grout.

d. All anchor bolts shall be headed. Dry pack around void where anchor bolt penetrates masonry face shell.

e. Fill all masonry cores with grout and immediately consolidate with a mechanical vibrator having a ¾" head and operating at 5000 RPM submerged.

f. Pour grout to 1-1/2 inches below top of masonry unit except at finish course. Immediately remove grout or mortar on exposed faces.

g. Form construction joints by stopping grout 1-1/2 inches below top of wall. If work is to be stopped for more than 1 hour, form construction joint with block top surface free of mortar or grout.

h. Cleanout openings shall be provided for all cells at the bottom of each pour of lifts exceeding 5'. The openings shall be made prior to the start of laying and shall be of sufficient size and location to allow flushing away of mortar droppings and debris. Cleanout openings may be cut in the blocks.

D. CLEANING AND FINISHING:

1. Carefully clean exposed masonry of grout droppings or stains before mortar or grout sets up and leave perfectly clean. Do not use metal bristled brushes or acid washing. If mortar or grout droppings are allowed to set-up on exposed surfaces, remove discolored units and install new units.
2. Repair damaged masonry, fill interstices between masonry and other materials, and fill pin holes carefully with mortar to match adjoining work.
3. See Division 7 for clear waterproofing on exposed masonry above grade by others.

E. PROTECTION

1. Protect top of unfinished work where mortar or grout has not yet set, with water-repellent covering.

F. TESTS AND INSPECTION
1. Tests shall be performed in accordance with Division 1 of these specifications.

END OF SECTION

Division 05 - METALS

COMMON WORK RESULTS FOR METALS Section 05 05 00

1. GENERAL:

A. SUMMARY: Provide Common Work Results for Metals, as shown and specified per Contract Documents.

B. REFERENCES:
1. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   b. ASTM F2329: Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
2. American Welding Society (AWS):
   a. AWS A2.4: Structural Welding Symbols.
   b. AWS D1.1: Structural Welding Code - Steel.
   c. AWS D1.3: Structural Welding Code - Sheet Steel.
3. Steel Structures Painting Council (SSPC):
   a. General: Painting Manual.
   b. SSPC-Paint 15: Steel Joist Shop Primer.
   c. SSPC-Paint 23: Latex Primer for Steel Surfaces.
   d. SSPC-Paint 25: Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II.

C. SUBMITTALS:
1. General: Submit product data and test reports.
2. Certificates:
   a. Welders: Certify that welders employed on the Work have met AWS qualifications within the past twelve (12) months.
   b. High Strength Bolts: Two (2) certified copies of inspection test reports for each production lot indicating proof load, tensile strength (wedge test), and hardness.

D. QUALITY ASSURANCE:
1. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
2. Source Quality Control:
   a. General: Material delivered with certificates classified as "identifiable"; without certificates classified as "unidentifiable".
   b. Testing of "Unidentifiable" Material: Tests by testing agency; paid for by Contractor. Test material not identifiable by heat number and mill test or other acceptable manufacturer's identifications per ASTM A370 as follows.

2. PRODUCTS:

A. MATERIALS:
1. Bolts, Nuts and Washers:
   a. General: Comply with ASTM F2329 where connector may be exposed to moisture.
   b. Machine Bolts and Nuts: ASTM A307, Grade A, including Supplementary Requirement S1; nuts per ASTM A563.
   c. Anchor Bolts: ASTM A307, Grade A or C, including Supplementary Requirement S1; nuts per ASTM A563.
   d. Washers: ASTM F436; compressible washer type direct tension indicators, ASTM F959.
   e. Lock-washers: ANSI B27.1; helical spring type, carbon steel; medium series.
2. Welding:
   a. General: Per AWS D1.1.
   b. Sheet Steel: AWS D1.3.
3. Primer:
   a. General: Fast-curing, lead- and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS TT-P-664. Comply with the requirements of Section 09 91 00 - PAINTING for surfaces to receive subsequent coats of paint.

b. Shop Primer: SSPC-Paint 15; VOC compliant.
c. Latex Primer: SSPC-Paint 23; VOC compliant.
d. Zinc Oxide, Alkyd, Linseed Oil Primer: SSPC-Paint 25; VOC compliant.

3. EXECUTION:

A. PREPARATION:
1. Examination: Examine conditions of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Placement: Refer to Section 05 12 00 - STRUCTURAL STEEL FRAMING, 05 50 00 - METAL FABRICATIONS, and 05 59 00 - METAL SPECIALTIES.

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STRUCTURAL STEEL Section 05 12 00

1. GENERAL

A. SECTION INCLUDES

1. Structural steel work is as shown on drawings, including schedules, notes and details to show size and location of members, typical connections and type of steel required.
2. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on drawings.
3. Shop priming and field touch-up to extent specified.
4. Grouting under base plates.

B. REFERENCES

1. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc. – 13th edition.
2. AISC Specifications for the Design Fabrication and Erection of Structural Steel for Buildings, including the Commentary and Supplements thereto as issued.
3. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.
4. AISC – Specification for Structural Joints Using ASTM A325 or A490 Bolts.
5. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.
6. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings.
7. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
8. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
9. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
10. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
11. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
12. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
13. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts;
14. ASTM A 992/A 992M - Standard Specification for Structural Steel Shapes.
15. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
16. ASTM E 94 - Standard Guide for Radiographic Examination.
17. ASTM E 164 - Standard Practice for Ultrasonic Contact Examination of Weldments.
18. ASTM E 165 - Standard Test Method for Liquid Penetrant Examination.
19. ASTM E 709 - Standard Guide for Magnetic Particle Examination.
20. ASTM F 436 - Standard Specification for Hardened Steel Washers.
21. ASTM F 1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

C. SUBMITTALS

1. See Division 1 for submittal procedures. Allow adequate time to check the number of drawings in each submittal.
2. Product Data: Submit copies of producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data required to show compliance with these specifications (including specified standards).
3. Certified Mill Test Reports: Structural Steel (each type) indicate chemical, physical properties, destructive test analysis and non-destructive test analysis.
4. Welding electrodes, including manufacturer's recommendations.
5. Welding gas.
6. Unfinished bolts and nuts.

7. Structural Steel Primer Paint.
8. High-strength bolts, including nuts and washers.
9. Shop Drawings: Submit shop drawings, including complete details and schedules for fabrication and shop assembly of members.
   a. Include details of cuts, connections, camber, holes per Figure 5.2 of AWS D1.1-08 or AISC Section J1.8, weld position plan and other pertinent data. Indicate welds by standard AWS symbols, and show size, length and type of each weld.
   b. Provide setting drawings, templates and directions for installation of anchor bolts and other anchorages to be installed for work specified in other Sections.
   c. Shop drawings shall use the "United States Standards" system dimensioning (feet, inches, etc.).
   d. No deviation of structural details or framing shall be made in the shop drawings without prior approval by the City.
   e. All approved deviations from the contract documents through Request for Information (RFI) process shall be referenced on the shop drawings with appropriate RFI numbers.
   f. List of beams to be galvanized.
10. Weld Procedures: Trade Contractor shall submit all welding procedures for review by the Testing and Inspection firm and the City. Weld procedures shall be qualified as described in AWS D1.1. All CJP single and/or double groove welds shall be back gouged unless otherwise noted on the drawings. Weld procedure shall indicate joint details and tolerances, back gouge, preheat and interpass temperature, postheat treatment, single or multiple stringer passes, peening of stringer passes for groove welds except for the first and the last layers, electrode type and size, welding current polarity and amperes and root treatment.
11. Test Reports: Submit copies of test conducted on shop and field welds and bolted connections. Include data on type of tests conducted and test results.
12. Provide Procedure Qualification Records (PQRs) and Weld Procedure Qualifications (WPSs) per AWS D1.1 as required.
13. Welders Certificates: All field welders shall be job certified per AWS D1.1. All shop welders shall be job certified for FCAW per AWS D1.1.
14. Submit Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

D. QUALITY ASSURANCE
   1. Fabricate structural steel members in accordance with AISC "Steel Construction Manual." Fabricator shall be approved by the City of San Diego.
   2. Continuous inspection by a Special Inspector approved by the City will be provided during fabrication or the fabrication will be performed in the shop of a fabricator approved by the City of San Diego.
   3. Inspection agency approved by the City and by the governing agency will perform visual inspection of all welds.
   4. Trade Contractor's Responsibility: The Trade Contractor alone shall be responsible for correct fitting of structural members and the elevation and alignment of the finished structure. The Trade Contractor shall be responsible for establishing, setting and maintaining control points and building lines to be used in plumbing the structural steel frame in accordance with AISC Code of Standard Practice, Section 7.11 and shall verify the following:
      a. Verify that anchor bolts are located as specified on the Drawings and are in proper relation to the control points and building lines, prior to setting of structural steel.
      b. Verify that structural steel members have been located, elevated, plumbed and aligned in relation to the control points and buildings lines, within the tolerance permitted by AISC Code of Standard Practice, Section 7.11 and as specified in Section 3.3. Any adjustments necessary in the steel frame because of fabrication, construction or erection discrepancies in elevations and alignment shall be the responsibility of the Trade Contractor.
   5. Codes and Standards: Comply with Paragraph 1.3 and provisions of following, except as otherwise indicated:
      a. AISC "Code of Standard Practice for Steel Buildings and Bridges.

b. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" and including the Commentary" and Supplements thereto as issued.
c. AWS D1.1 "Structural Welding Code.
d. ASTM-A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes. Sheet Piling and Bars for Structural Use."
e. California Building Code.

6. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with the AWS "Procedure Qualification" and "Welder Qualification".
7. Source Quality Control: Materials and fabrication procedures are subject to inspection and test in mill, shop and field, conducted by the Contractor's qualified inspection agency. Such inspections and tests will not relieve Trade Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
8. Testing Laboratory shall perform conformance testing in accordance with CBC Chapter 17.
   a. Identified Structural Steel: Steel shall be identified in accordance with ASTM A6-05 and bear legible heat numbers acceptable to the Testing Laboratory which shall make positive identification of structural steel as to mill source, heat numbers, and certified mill analysis and test report for each heat. Obtain the mill test reports, and furnish report certifying identity of steel.
   b. Unidentified Structural Steel: Steel not identified and certified as specified above shall be tested according to following requirements. Structural steel fabricator shall cut samples under direction of the Testing Laboratory. Testing Laboratory shall machine or otherwise prepare the specimens, and perform testing of each 5 tons or fraction thereof, for each size of unidentified steel except, in the case of random pieces or steel having Fy equal to or greater than 36 ksi, testing of each piece is required. Tests required are:
      i. For pipe, one tension and elongation test and one flattening test of each size.
      ii. For all other steel, one tension and elongation test and one bend test for each size.
   c. For all other identified steel having Fy equal to or greater than 36 ksi, one tension and elongation test and one bend or flattening test, as applicable, for each heat plus steel manufacturer's certified mill analysis and test report as specified above shall be performed as requested by Owner.
   d. Testing of High Strength, Bolts, Nuts and Washers: In accordance with CBC Chapter 17.
   e. Promptly remove and replace materials or fabricated components which do not comply.
9. Preheat and Interpass Temperatures:
   a. The preheat temperatures and conditions given in AWS D1.1, Chapter 3 shall be strictly observed with special attention given to Paragraph 3.5 for the thickness of material to be welded.

E. QUALIFICATIONS
1. Qualifications: Trade Contractor shall determine, warrant, and certify that producer, detailer, fabricator, erector, materials suppliers and all others involved in the Work of this Section have a minimum two years documented experience in the construction of at least five buildings of similar complexity. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
2. Fabricator: Fabricate in accordance with AISC specializing in work performed in this Section. Fabricator shall be approved by the City of San Diego.
3. Erector: Company specializing in performing the work of this Section with minimum two years documented experience in the erection of structural steel for at least five buildings of similar complexity.

F. FIELD MEASUREMENTS
1. Verify that field measurements are as shown on the Contract Documents. Trade Contractor shall furnish accurate as-built drawings of bolt settings for work specified in this Section and other Sections.

G. DELIVERY, STORAGE AND HANDLING
1. Deliver materials to site at such intervals to insure uninterrupted progress of work. Protect all steel materials from damage during shipping, handling, and storage on the site. Steel showing dents, creases, deformations, weathering, or other defects is not acceptable. Deliver

welding electrodes to site in unbroken packages bearing the manufacturer's name and label identifying the contents.

a. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay that work. Anchor bolts and template delivery shall be indicated as a milestone date on the project construction schedule.

2. Storage of fabricated steel at the site shall be the responsibility of the Trade Contractor. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and package materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as required by the City.
4. Other material shall be stored in weather-tight containers until ready for use in the Work. Containers must be stored in a dry place.
5. The City reserves the right to reject any material that has become damaged because of improper storage.
6. Storage areas must be shown on the current site use plan.
7. High-strength bolts and certificates shall be identified, stored and tracked at the site until they are installed.

2. PRODUCTS

A. MATERIALS

1. Steel Angles and Channels: ASTM A 36/A 36M.
2. Steel W Shapes and Tees: ASTM A 992/A 992M, Grade 50 steel.
3. HSS (rectangular, square or round): ASTM A 500, Grade B.
4. Machine Bolts and Nuts (Use only where indicated): Carbon steel, ASTM A 307, Grade A galvanized to ASTM A 153/A 153M, Class C.
5. High-Strength Structural Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M) with matching ASTM A563 nuts and ASTM F844 washers, Type 1, medium carbon, galvanized.
6. Unheaded Anchor Rods: ASTM F 1554, Grade 36 unless otherwise noted, plain, with matching ASTM A 563 or A 563M nuts and ASTM F 436 Type 1 washers.
7. Welding Materials: AWS D1.1; type required for materials being welded.
8. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C 1107 and capable of developing a minimum compressive strength of 7,000 psi at 28 days.
9. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
10. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
11. Anchor Bolts: ASTM-F-1554, non-headed type, unless otherwise indicated.
12. Welding Materials: AWS D1.1; type required for materials being welded. All welding electrodes shall be low hydrogen and shall have a minimum Charpy V-Notch toughness of 20 ft. lbs. at minus 20-degrees Fahrenheit per AWS. Use of FCAW T4 wires is specifically prohibited.
13. Electrodes for Flux Cored Arc Welding (FCAW) shall not have diameter greater than 7/64 inch and an electrical stick out greater than two inches.

B. FABRICATION

1. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in the shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on contract documents. Properly mark and match- mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
2. Cleaning and Straightening: Wire brush steel materials and clean off loose mill scale and rust. Straighten steel members by non-injurious methods prior to fabrication. Remove twists or bends after punching or working component parts of a member before the parts are

assembled. Produce finished members free from twists, bends, and open joints when erected.

3. Provide and deliver test samples for material properties verifications per Paragraph 1.5.J.3 to the testing laboratory.
4. Connections: Weld or bolt shop connections, as indicated.
5. Welded Construction: Strictly comply with AWS D1.1 code for procedures, appearance, and quality of welds, and methods used in correcting defective welding work.
6. Assemble and weld built-up sections by some method which will produce true alignment of axes without warp.
7. Anchor Bolts:
   a. Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
   b. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.
   c. Punch and drill or ream holes in base and bearing plates. Do not make or enlarge the holes by burning except at grouting holes in column bases plates and then only with the approval of the City.
8. Base Plates: Press or mill steel column base plates 4" thick or less for straight contact bearing between plate and column.
9. Gas Cutting: Use of a cutting torch is allowed where the metal being cut is not stressed during the operation, and provided stresses are not transmitted through flame-cut surface. Make gas cuts with a smooth regular contour. Deduct 1/8" from the width of gas cut edges to determine the effective width of gas cut members. Make reentrant gas cut radius as large as possible, but 1" minimum. For reentrant corners (e.g. slots in tube steel braces) drill 1" diameter pilot holes.
10. Welded Construction: Strictly comply with AWS Codes for procedures, appearance and quality of welds, and methods used in correcting welding work. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.
    a. Conform to AWS D1.1 and D1.3, as modified by referenced AISC Standards, and as indicated or noted on Drawings. Employ welding operators qualified in accordance to AWS D1.1 and D1.3, as applicable, who are thoroughly trained and experienced in arc welding and that produce uniformly reliable groove and fillet welds in flat, vertical, and overhead positions, and make neat and consistent welds. Weld all structural steel joints by shielded electric-arc method unless otherwise shown, specified, or approved.
    b. Qualifications of Welders: Each welder working on the Project shall be assigned an identification symbol or mark. Each welder shall mark or stamp his identification symbol at each completed weldment.
    c. Welders and Welding operators shall be qualified per AWS "Standard for Qualifications". The Trade Contractor shall require any welder to retake the test when, in the opinion of the City or the Inspector, the work of the welder creates a reasonable doubt as to the proficiency of the welder. All such tests shall be made using the filler metal to be used in actual fabrication.
    d. Storage and Care of Electrodes: Coating of low-hydrogen type electrodes shall be thoroughly dry as used. Conform to AWS D1.1. Use electrodes taken from hermetically sealed packages within time limit specified therein after package is opened. Electrodes not used within allowable time period and electrodes that have been exposed more than one hour to air having a relative humidity of 75% or greater shall be dried according to AWS D1.1 before they are used, or shall be reconditioned according to electrode manufacturer's recommendations. Electrodes so dried or reconditioned and not used within allowable time period shall be redried before use. Electrodes of any class that have been wet shall not be used under any conditions.
    e. Preparation: Clean surfaces to be welded of all paint, grease, oil, mill scale, and foreign matter. Clean weld each time the electrode is changed. Chip full surface of hand guided and controlled flame-cut edges before welding. Steel surfaces prepared with automatic or

mechanically guided and controlled equipment need not be ground or chipped before welding.

f. Procedures: During assembling and welding, hold components of a built-up member with adequate clamps, bolts, or other means to keep parts straight and in tight contact. GMAW, FCAW-G, GTAW and EGW shall not be performed when the wind velocity in the immediate vicinity of the weld exceeds three miles per hour. Welding performed within an enclosed area, and not subject to drafts may be deemed to satisfy this requirement. SMAW, FCAW-S, AND SAW may be performed without limitation to wind velocity, provided the wind does not affect the appearance of the molten weld puddle. Cut out defective welding with chisel or air arc and replace.

g. Maintain record of welding procedures, welders employed, date of qualification and identification symbol of mark. Submit at completion of Work, or upon request, certified copies of records.

h. Related Welding: Conform to AWS D1.1 for fillet, plug, slot, partial or flared groove, and lap. Welding starts and stops do not count as part of the effective length of any weld.

i. Weather Exposed Welds: Seal weld around entire connection where welds remain exposed to weather, in addition to required structural welding.

j. Weld Characteristics: Clean and wire brush all welds. Visual inspection of finished welds must show uniform section, smoothness of welded metal, feather edges without undercuts or overlays, freedom from porosity and inclusions, and good fusion and penetration into base metal at edges and ends of fillet welds.

k. Weld Finishing: Grind exposed welds to smooth surfaces free of holes, slag, or other defects, flush with adjoining surfaces. No finish treatment is required for permanently concealed welds.

11. Bolted Construction
    a. Machine Bolts: Make connections with machine bolts only where indicated.
    b. High-Strength Steel Bolting: For joints connected by high strength steel bolts, hardened washers, and nuts tightened to high tension, conform materials, methods of installation and tension control, and wrenches to Reference Standards. Install all high-strength bolts under inspection required by CBC Chapter 17.
        i. Minimum bolt lengths shall be per AISC - 13th Edition Table 7-15.
        ii. Clean all contact surfaces of bolted parts and threads free of scale, slag, burrs, pits, dirt, paint, and other foreign material or defects which would prevent solid seating of connected parts.
        iii. Install hardened washers per AISC Standards.
        iv. Mark fully tightened bolts with identifying symbol.
    c. Tension Set or Load Indicator Bolts, Nuts, and Washers: May be used for the field installation of high-strength bolts.
12. Fabricate connections for bolt, nut, and washer connectors.
13. Develop required camber for members.

C. FINISH
1. General: Shop paint structural steel work, except as follows:
    a. Steel surfaces embedded in concrete or masonry.
    b. Structural steel which is completely closed-in by interior or exterior building finish.
    c. Do not paint surfaces which are to be welded or high-strength bolted with slip critical (SC)-type connection.
    d. Do not paint surfaces which are scheduled to receive sprayed-on fireproofing.
2. Prepare structural component surfaces in accordance with SSPC-Paint 20.
3. Shop paint all structural steel which will be exposed in the finished work.
    a. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide a uniform dry film not less than 1.5 mils thick. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.
4. Galvanize all steel exposed to weather per ASTM A123. Provide minimum 1.7 oz/sq ft. galvanized coating.

D. SOURCE QUALITY CONTROL AND TESTS
1. Testing Agency: An independent testing and inspecting agency shall perform shop tests and inspections and prepare test reports.
   a. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts", testing at least 15 percent of bolts at each connection.
3. Welded Connections: Visually inspect all shop-welded connections. Non-destructively test at rate of 100 percent of welds to establish qualifications of each welder. If defects occur in less than 5% of the welds tested, reduce testing to 25%. Use one of the following testing methods as appropriate:
   a. Radiographic testing performed in accordance with ASTM E 94.
   b. Ultrasonic testing performed in accordance with ASTM E 164.
   c. Liquid penetrant inspection performed in accordance with ASTM E 165.
   d. Magnetic particle inspection performed in accordance with ASTM E 709.

3. EXECUTION

A. EXAMINATION
1. Verify that field conditions are acceptable and are ready to receive work.
2. Beginning of installation means erector accepts existing conditions.

B. ERECTION
1. General: Comply with AISC Specifications and Code of Standard Practice, and as herein specified.
2. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.
3. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete the work.
4. Setting Bases and Bearing Plates: Furnish and deliver anchor bolts with setting drawings and templates. Verify position of bolts prior to delivery of steel; report errors or deviation for correction to the City.
   a. Clean concrete bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
   b. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
   c. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
5. Field Assembly: Set structural frames accurately to lines and elevations. Align and adjust various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   a. Level and plumb individual members of structure within specified tolerances.
   b. Splice members only where indicated and accepted on final shop drawings.
   c. Do not enlarge unfair holes in members by burning or by use of drift pins except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
   d. All back-up bars, dams, and runoff tabs shall be removed: the weld, base metal shall be ground flush and smooth per AWS.
6. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in structural framing. Cutting will be permitted only on secondary members which are not under stress. Finish gas-cuts sections equal to a sheared appearance when permitted.

7. Damaged Members: Remove members damaged to an extent impairing appearance, strength or serviceability, as determined by architect and replace with new members at no extra cost to the owner.
8. Grouting of Base Plates and Bearing Plates
   a. Plates shall be set and anchored to the proper line and elevation. Metal wedges, shims and/or setting nuts shall be used for leveling and plumbing the structural members, including plumbing of columns. Concrete surfaces shall be rough, clean, free of oil, grease and laitance, and shall be damp. Metal surfaces shall be clean and free of oil, grease, and rust. Addition of water, mixing and placing, shall be in conformance with the material manufacturer's instructions. Grout shall be mixed by using a mortar mixer. Batches shall be of size to allow continuous placement of freshly mixed grout. Placing shall be quick and continuous. Exposed surfaces shall have smooth, dense finish. Fill grout space solid with non-shrink grout.
   b. Base plates shall be grouted prior to the placement of structural concrete slabs and/or concrete fill on metal decks.
9. Field Touch-up Painting: After structural steel erection and connections are completed, inspected, and approved, clean all connections to be painted and damage to shop painted surfaces, and apply a field touch-up coat of same primer used for shop coat.

C. TOLERANCES
1. Erect members to the tolerances conforming to referenced AISC Standards and CBC, except as follows:
   a. Vertical Dimensions: Measured from top of beams at their connections at any column, variation not more than 1/4" plus or minus per story or, when variations are accumulative from floor to floor, not exceeding 3/8" per story exclusive of column shortening due to dead load.
   b. Plumb Displacement: Center line of columns from established column line, no more than 1" toward or away from established center line.
   c. Floor Elevation: Top of steel elevation for floor elevation will be considered level if on any one floor, all beam connecting to column at the column connections do not vary more than 3/8" plus or minus. See Section 03 30 00 for concrete finishing.
   d. Horizontal Dimension Variances: Governed by specified column plumb displacement.

D. QUALITY CONTROL – SHOP AND FIELD
1. An independent testing and inspection agency shall inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports in accordance with CBC Chapter 17.
2. Testing Agency shall conduct and interpret test and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.
3. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished safely.
4. Correct deficiencies in structural work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Trade Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.
5. Welding: Inspect and test during fabrication and erection of structural steel assemblies, as follows:
   a. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in the work. Record work required and performed to correct deficiencies.
   b. Inspect all welds. All welds shall be accepted visually prior to performing any non-destructive testing. Groove weld shall be inspected by ultrasonic or other approved non-destructive test methods. All testing shall be performed to AWS D1.1 Table 6.3 cyclically loaded non tubular connections.
   c. Ultrasonic testing shall be performed by a specially trained and qualified technician who shall operate the equipment, examine welds, and maintain a record of welds examined,

defects found, and disposition of each defect. All defective welds shall be repaired and costs for retesting defective welds shall be paid by Trade Contractor.

d. Rate of Testing: All completed welds contained in joints and splices shall be tested 100 percent either by ultrasonic testing or by radiography.
e. Welds inspected by visual or ultrasonic testing or any other approved method that does not meet the requirements of AWS D1.1 shall be repaired or replaced as prescribed by AWS D1.1 repairs to confirmed repair work. Additional testing of repaired or replaced areas shall be made at the Trade Contractor's expense.
f. Should defects appear in base metal and/or in welds tested, repairs of defects in base metal or welds shall be similarity inspected, as approved by City at the Trade Contractor's expense until satisfactory performance is assured.
g. Magnetic Particle Testing: Magnetic particle testing when required shall be provided in accordance with AWS D1.1 for procedure and technique. The standards of acceptance shall be in accordance with AWS D1.1- Qualification.

6. Prior Testing of Base Material: Test material prior to fabrication in order to detect possible defects that would require difficult and expensive repair.
7. As erected Drawings: After all steel has been erected, correct or revise shop drawings to correspond with the changes made in the field.
8. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

E. CONSTRUCTION WASTE MANAGEMENT
1. Construction waste shall be managed in accordance with provisions of Division 01 Construction Waste Management. Documentation shall be submitted to satisfy the requirements of that Section.

END OF SECTION

METAL FABRICATIONS Section 05 50 00

1. GENERAL

A. RELATED DOCUMENTS
1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section as fully as if repeated herein.

B. DESCRIPTION OF WORK
1. Definition: Metal fabrications include items made from iron, steel, and aluminum shapes, plates, bars, strips, tubes, pipes, and castings which are not a part of structural steel or other metal systems specified elsewhere.
2. The works includes the furnishing and installing of all miscellaneous metal work and related connections complete as indicated on the drawings and as specified.
3. Structural steel is specified in another section within Division 5.

C. CODES AND STANDARDS
1. The editions referenced herein of Federal Specifications (Fed. Spec.) and of the other standards and specifications published by the following organizations, apply to the work only to the extent specified by the reference.
   a. American National Standards Institute (ANSI)
   b. American Institute of Steel Construction (AISC)
   c. American Society for Testing and Materials (ASTM)
   d. American Welding Society (AWS)
   e. National Association of Architectural Metal Manufacturers (NAAMM)
   f. "California Building Code, current edition (CBC)"

D. QUALITY ASSURANCE
1. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

E. SUBMITTALS
1. Submittal procedures and quantities are as specified in Division 1.
2. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
3. Shop Drawings:
   a. Submit fully detailed shop drawings of all miscellaneous metal work giving sizes; details of fabrication and construction; methods of assembly and bracing; and locations of hardware, anchors, and all accessories.
   b. Drawings shall include all shop and fabrication details, including cuts, copes, connections, holes, bolts and welds. All welds, both shop and field, shall be indicated by standard welding symbols in AWS D1.1. Drawings shall show the size, length and type of each weld. All materials to be brazed or soldered shall have connections indicated by symbols which are industry standards.
   c. Contractors shall be responsible for all fabrication and for correct fitting of metal members. No material shall be fabricated or delivered to the site until the shop drawings have been reviewed and returned to the Contractor.

F. FIELD MEASUREMENTS AND TEMPLATES
1. Secure all field measurements required for proper and adequate fabrication and installation of the work. Furnish templates for exact location of items to be embedded in concrete and masonry and setting instructions required for all installation work.

G. DELIVERY AND STORAGE OF MATERIALS
1. Deliver material in time to insure uninterrupted progress of the work. Materials shall be stored in a manner to preclude damage and permit ready access for inspection and identification of each shipment. Steel materials, either plain or fabricated, shall be stored above the ground upon platforms, pallets, skids, or other supports. Materials shall be kept free from dirt, grease,

and other foreign matter, and shall be protected from corrosion. Material showing evidence of damage will be rejected and shall be immediately removed from the work.

2. PRODUCTS

A. MATERIALS

1. Ferrous Metals:
   a. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, comply with AISC AESS (Architectural Exposed Structural Steel) and use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
   b. Steel Plates, Shapes and Bars: ASTM A36.
   c. Steel Tubing: Cold formed, ASTM A 500, Grade B.
   d. Steel Pipe: ASTM A 53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.
   e. Handrail brackets for steel pipe shall be round or flat top as directed by City.
   f. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
   g. Fasteners:
      i. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
      ii. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
      iii. Lag Bolts: Square head type, FS FF-B-561.
      iv. Machine Screws: Cadmium plated steel, FS FF-S-92.
      v. Wood Screws: Flat head carbon steel, FS FF-S-111.
      vi. Plain Washers: Round, carbon steel, FS FF-W-92.
      vii. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
      viii. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
      ix. Lock Washers: Helical spring type carbon steel, FS FF-W-84.
      x. As indicated on drawings. Contractor shall provide stainless steel anchors for highly corrosive environments.
2. Electrodes: All arc welding electrodes shall conform to AWS A5.1 or A5.5 E70XX.
3. Shop primer for steel, other than galvanized, shall meet Federal Specification TT-P-86G, Type III (red lead) or TT-P-645 (zinc chromate).
4. Galvanizing: Zinc coating shall conform to ASTM A123. Zinc coating for threaded products shall conform to ASTM A153. Treatment for damaged galvanized surfaces shall be Galvaloy, Galvicon or Drygalv, or equal.
5. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A153.
6. Pipe Sleeves: Pipe sleeves through concrete walls and footings shall be standard weight, wrought iron, mild steel, or cast iron sleeves with not less than 1/2 inch space all around between the sleeve and pipe.

B. FABRICATION - GENERAL

1. Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work. Steel fabrication exposed to weather shall comply with AISC Architecturally Exposed Structural Steel fabrication requirements.

2. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows and for all items exposed to weather unless otherwise indicated by City.
   a. ASTM A 153 for galvanizing iron and steel hardware.
   b. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.

c. ASTM A 386 for galvanizing assembled steel products.

C. ROUGH HARDWARE
1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division-6 sections.
2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

D. MISCELLANEOUS FRAMING AND SUPPORTS
1. Provide miscellaneous steel framing and supports, which are not a part of structural steel framework, as, required to complete work.
2. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes, plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
3. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise indicated, space anchors 24" o.c. and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps. Galvanize exterior miscellaneous frames and supports where indicated.

E. MISCELLANEOUS STEEL TRIM
1. Provide shapes and sizes for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work. Galvanize miscellaneous steel trim where indicated.

3. EXECUTION

A. PREPARATION
1. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might avoid delaying work.
2. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts, safety tread nosing, and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. INSTALLATION
1. General:
   a. Miscellaneous metal items shall be installed as rapidly as the progress of other work will permit. Splices and field connections shall be made with bolts, except where welding or brazing is indicated or approved on the shop drawings. Fasteners shall be installed as hereinafter. Metal work shall be set accurately at the established lines and levels. Installation shall be in strict accordance with approved shop drawings and actual conditions, true and horizontal or perpendicular as the case may be, level and square with angles and edges parallel with related lines of the building.
   b. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
   c. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items, which are to be built into concrete, masonry, or similar construction.

d. Fit exposed connections accurately together to form tight hairline joints. Weld connections, which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind all welds and exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
e. After assembly, the various members forming parts of a completed frame shall be aligned and adjusted accurately before being fastened. Tolerances shall conform to the applicable requirements of AISC "Code of Standard Practice". Contact shall be cleaned before the members are assembled. Poor matching of holes shall be corrected by drilling to the next larger size.

2. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
3. Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
   a. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.
   b. Pack grout solidly between bearing surfaces and templates to ensure that no voids remain. See Section 03 30 00 for grout strength.
4. Touch up all damaged galvanized finishes due to installation, welding, threading or other work with treatment specified herein.

C. ADJUST AND CLEAN
1. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Repair factory finished surfaces as recommended by manufacturer.
2. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

END OF SECTION

SLIDE POLE SYSTEM Section 05 51 43

1. GENERAL:

A. SUMMARY: Provide Slide Pole System, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
C. SUBMITTALS:
   1. General: Submit product data and shop drawings.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE:
   1. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Slide Pole System:
      a. General: Model 19 brass fire pole manufactured by McIntire Brass Works, Inc.
      b. Alternate Manufacturers: Comparable products manufactured by BrassFinders, Inc., or approved equal.
      c. Stationary Pole: 2½ inch diameter, 5/32 inch thick wall, cold drawn brass tubing; height as shown.
      d. Landing Mat: ASTM D1056, Grade 2C2-E1, closed cell black neoprene mat, 32 inch diameter x 2 inch thick.
      e. Trim: Manufacturers standard floor and ceiling flanges and Floor Trim Kit.
   2. Fasteners: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Floor Hole: 37½ inch diameter, minimum.
   3. Trim: Install as shown. Trim mat to fit space.

* * *

METAL SPECIALTIES Section 05 59 00

1. GENERAL:

A. SUMMARY: Provide miscellaneous Metal Fabrications, as shown and specified per Contract Documents.

B. REFERENCES:
1. American Institute of Steel Construction (AISC):
   a. AISC 303: Code of Standard Practice for Steel Buildings and Bridges.
   b. AISC 325: Steel Construction Manual.
2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
3. American Welding Society (AWS):
   a. AWS A2.1: Structural Welding Symbols.
   b. AWS D1.1: Structural Welding Code - Steel.
   c. AWS D1.3: Structural Welding Code - Sheet Steel.
4. National Association of Architectural Metal Manufacturers (NAAMM): Metal Finishes Manual for Architectural and Metal Products.
5. The Society for Protective Coatings formerly Steel Structures Painting Council (SSPC): Painting Manual.

C. SUBMITTALS:
1. General: Submit product data, shop drawings and samples.
2. Closeout: Submit maintenance data and guarantee.

D. QUALITY ASSURANCE:
1. General: Fabricator and installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
2. Welding: Performed by certified welders per AWS.

2. PRODUCTS:

A. MATERIALS:
1. LEED Certification Requirements:
   a. VOC Materials Compliance:
      1. General: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory and the following:
      2. Primer and Paint: Green Seal Standard GS-47 Stains and Finishes.
   b. Recycled Metal Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost) of the total value of the materials for the project.
2. Steel:
   a. General: ASTM A36.
   b. Tubing (Rectangular and Square Hollow Structural Sections [HSS]): ASTM A500, Grade B.
   c. Pipe (Round Hollow Structural Sections [HSS]): ASTM A53, Type E or S, Grade B.
3. Steel Bar Grating Panels:
   a. General: Manufactured by the McNichols Co.
   b. Alternate Manufacturers: Comparable products manufactured by Grating Pacific, Inc., or approved equal.
   c. Awning: Item No. 6641180144.
   d. Railing: Item No. 6407610132.
4. Fastenings:
   a. General: Bolts, nuts, screws, washers, and other various fastenings necessary for proper erection of work; refer to Section 05 05 00 - COMMON WORK RESULTS FOR METALS. Galvanized steel fastenings or other non-rusting types for exterior steel work.
   b. Exposed in Finished Surfaces: Tamperproof countersunk Phillips flat head screws, unless otherwise shown; finish to match adjacent surfaces.
   c. Plastic Screw Anchors:
      1. General: Plastic Anchors manufactured by Hilti, Inc.
      2. Alternate Manufacturers: Comparable products manufactured by U.S. Anchor Corp., or approved equal.
      3. Plastic: Type HUD.
      4. Self-drilling: Type HFP.
      5. Impact: Type HPS.

d. Drilled-in Concrete Anchors:
1. General: Kwik Bolt TZ manufactured by Hilti, Inc.; stainless steel or galvanized for exterior work.
2. Alternate Manufacturers: Comparable products with current ICBO approval and equal or greater rated load capacity, manufactured by U.S. Anchor Corp., or approved equal.

5. Galvanizing:
a. General: Hot-dip process per ASTM A123 or ASTM A153, as applicable. Minimum coating: 2 oz. per square foot.
b. Repair Treatment:
1. Rod: Per ASTM A780.
2. Coating: Per SSPC-Paint 30: Weld-Through Inorganic Zinc Primer.

6. Plastic Cement: FS SS-C-153, Type 1.
7. Non-shrink Grout:
a. General: MasterFlow 555 manufactured by the BASF Chemical Co.
b. Alternate Manufacturers: Comparable products manufactured by the Euclid Chemical Co., or approved equal.

8. Protective Coatings:
a. Backing Paint: Zinc chromate, alkyd.
b. Bituminous Coating: FS TT-C-494, Type II; bituminous.

9. Primer: Refer to Section 09 91 00 - PAINTING.

B. FABRICATION:
1. Workmanship:
a. General: Shop assemble work in largest practical sections; minimize field connections. Grind smooth parts exposed to view; remove weld marks and leave free of fabrication marks. Miter corners and edges unless otherwise shown. Make members true to length so assembling may be done without fillers. Bends, twists, open joints in finished members, or projecting edges or corners at connections will not be permitted. Miter, cope, and block carefully to produce tight hairline joints. Provide lugs, clips, connections, bolts, and fastenings necessary to complete fabrication.
b. Exposed Steel: Comply with AISC City Representativeurally Exposed Structural Steel fabrication requirements.
c. Galvanizing: Galvanize steel in exposed exterior locations and in areas where moisture may be present at interior locations. Treat all areas burned off or damaged during fabrication with specified repair compound.
d. Reinforcement: Provide proper reinforcement for hardware, and other fabricated metal work, as required.
e. Welding: Use sequence welding to minimize distortion and heat stresses. Weld by shielded electric arc process per AWS. Use continuous welding along entire area of contact, except where spot welding is permitted. Grind all welds smooth on exposed surfaces. Spot welding not permitted on exposed surfaces.
f. Shop Painting and Priming of Surfaces to be Painted: Per SSPC standards.
g. Dissimilar Metals: Isolate with bituminous coating.

2. Fabrications:
a. General: Fabricate the following items, complete as shown.
b. Angle Thresholds: Steel, as detailed, with welded stud anchors; galvanize after fabrication.
c. Countertop Supports: Fabricate from steel angles as shown.
d. Steel Pipe Handrails: Fabricate handrail and brackets from galvanized steel shapes, plates and standard weight steel pipe per CBC and ADA requirements and as shown; welded, plugged and ground smooth.
e. Steel Railings and Guardrails: Fabricate from galvanized steel shapes, plates, standard weight steel pipe, bar stock and bar grating (Item No. 6407610132) per CBC and ADA requirements and as shown; welded, plugged and ground smooth. Weld to mounting plates where required.
f. Bollards: Galvanized steel tube sections, as shown, with open ends capped; welded and ground smooth.
g. Metal Bar Grate Awnings: Fabricate from galvanized steel shapes, plates, bars and specified bar grating (Item No. 6641180144) as shown; weld and grind smooth.
h. Ladder: Fabricate from steel sections per NAAMM Standards; punch side railings to receive steel rungs; space rungs at 12 inches on center; extend through stringers, weld around each end and grind smooth.

3. EXECUTION:

A. PREPARATION:
1. Examination: Examine conditions of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Performance:
   a. General: Install with workers skilled in the particular type of work required.
   b. Coordination: Deliver miscellaneous metal items to be installed in concrete or masonry, complete with all clips, anchors or bolts necessary to secure them in place.
   c. Workmanship: Set work plumb and true; properly assemble and erect in a rigid and workmanlike manner. Do cutting, punching, drilling and tapping for attachment of other work coming into contact with fabricated metal work where indicated or as directed. Do necessary cutting, drilling, and fitting for installation of fabricated metal work. Execute drilling, cutting, and fitting carefully; when required, fit work at job before finishing. No burning in field permitted. Replace, or repair parts damaged or injured during erection in an acceptable manner. Drill holes for fasteners to exact diameter as recommended by fastener manufacturer. Oversized holes or holes not properly located that produce misalignment of fastener will be rejected.
   d. Exposed Steel: Comply with AISC Architecturally Exposed Structural Steel installation requirements.
   e. Galvanizing: Treat areas burned off or damaged during fabrication or erection with specified repair compound.
   f. Field Touch-up: Touch-up damaged surfaces and field welds of steel, scheduled to be painted, per SSPC standards.
   g. Protection:
      1. General: After erection, provide proper protection for fabricated metal items from other construction operations.
      2. Dissimilar Metals: Isolate with bituminous coating.
3. Installation:
   a. General: Install the metal items, complete as shown.
   b. Angle Thresholds: Set in concrete, as shown.
   c. Counter Supports: Anchor to walls and install countertop as shown.
   d. Steel Pipe Handrails: Anchor to walls as shown.
   e. Steel Railings and Guardrails: Anchor to floor and walls as shown; touch-up all primed surfaces damaged during installation. Coordinate with millwork supplier where wood screws are necessary for attachment.
   f. Bollards: Set in concrete and fill, as shown.
   g. Metal Bar Grate Awnings:
   h. Ladder: Fasten at top, bottom, and intermediate points not over 6'-0" apart with brackets for fastening; use expansion bolts in solid blocking, unless otherwise shown.

* End Division 05 *

Division 06 - WOOD, PLASTICS & COMPOSITES

COMMON WORK RESULTS FOR WOOD, PLASTICS AND COMPOSITES — Section 06 05 00

1. GENERAL:

A. SUMMARY: Provide Common Work Results for Wood, Plastics and Composites, as shown and specified per Contract Documents.

B. REFERENCES:

1. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   b. ASTM F2329: Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
2. American Society of Mechanical Engineers (ASME): Standards for anchors and fasteners.
3. American Wood Preservers Association (AWPA): AWPA Book of Standards.

C. SUBMITTALS:

1. General: Submit product data and samples if specifically requested.
2. Certificates: Submit mill certificate verifying pressure treatment compliance as specified, for each shipment received, in addition to a stamp on each piece of lumber, from an approved independent inspecting agency operating under the overview of the American Lumber Standards Committee, Inc. (ALSC).

2. PRODUCTS:

A. MATERIALS:

1. LEED Certification Requirements:
   a. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS-36.
2. Hangers, Clamps, Straps and Anchors:
   a. General: Manufactured by Simpson Strong Tie Co., Inc.; types as shown.
   b. Alternate Manufacturers: Comparable products with current ICC ES approval and equal or greater rated load capacity, manufactured by USP Lumber Connectors, or approved equal. Submit ICC ES Report for review for all alternate products.
   c. Special Fabrications: Refer to Section 05 50 00 - METAL FABRICATIONS.
3. Anchors and Fasteners:
   a. General: Comply with ASTM F2329 where connector may be exposed to moisturte.
   b. Nails: ASTM F1667, common wire; hot-dipped galvanized for pressure preservative treated and exterior work; electro-galvanized for other work.
   c. Bolts and Nuts: ASTM A307, Grade A, including supplementary requirement S1; galvanized for exterior work.
   d. Washers: Malleable iron or standard cut steel; galvanized for exterior work.
   e. Screws: Wood and lag screws per ANSI/ASME B 18.2.1; galvanized for exterior work.
   f. Specialty Fasteners:
      1. General: Manufactured by Hilti, Inc.; galvanized for exterior work.
      2. Alternate Manufacturers: Comparable products with current ICC ES Report and equal or greater rated load capacity, manufactured by the US Anchor Corp., or approved equal.
      3. Expansion Bolts: Kwik Bolt TZ.
      4. Concrete Screws: Kwik Con II manufactured by Hilti, Inc.; galvanized for exterior work.
      5. Powder Actuated Fasteners: Type as shown, manufactured by Hilti, Inc.; galvanized for exterior work.
      6. Screw Anchors: Type HUD (plastic), HFP self drilling or HPS impact as shown, manufactured by Hilti, Inc.
4. Adhesive: CS 35-61, Type II, water-resistant.
5. Wood Preservative:
   a. General: Manufactured by J. H. Baxter Co.; factory applied treatment, unless otherwise noted.

b. Alternate Manufacturers: Comparable products manufactured by the California Cascade Industries, or approved equal.
c. Pressure Treatment: Per AWPA Standards using water borne preservative.
d. Surface Application: Per AWPA Standards; Clear type.
e. Fire Retardant: Per AWPA Standards, Exterior Type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25.

3. EXECUTION:

A. PREPARATION:
1. Examination: Examine conditions of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Placement: Refer to Section 06 10 00 - ROUGH CARPENTRY, 06 17 33 - WOOD I-JOISTS, 06 18 - GLUED LAMINATED STRUCTURAL UNITS, 06 20 00 - FINISH CARPENTRY, 06 41 14 - WOOD VENEER CASEWORK and 06 41 17 - PLASTIC LAMINATE VENEER CASEWORK.

* * *

ROUGH CARPENTRY Section 06 10 00

1. GENERAL

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

B. DESCRIPTION OF WORK
   1. Provide framing lumber, plywood sheathing, blocking, plates, curbs, etc. and incidental carpentry work supporting other work. Furnish and install standard product rough hardware and specially fabricated rough hardware in connection with work of this section.
   2. The following categories of work are included under other sections of these specifications:
      a. Fabrication of special rough hardware that are in connection with work of this section.
      b. Concrete formwork.

C. QUALITY ASSURANCE
   1. Grading Standards: "Grading Rules for Western Lumber, 5th Edition." "Product Standard PS 1-83 for Softwood Plywood/Construction and Industrial." All lumber and plywood shall be grade-marked. All lumber and plywood shall be grade-stamped. Do not mark lumber in an area where it is scheduled to be exposed.
   2. Codes: All work shall be executed in accordance with Chapter 23 of the "California Building Code, current edition (CBC)".

D. SUBMITTALS
   1. Submit the following: quantities and procedures are as specified in Division 1.
      a. Wood treatment data including treatment plant's certificate of compliance with indicated requirements.

E. DELIVERIES AND STORAGE
   1. Lumber shall be piled and protected to ensure proper protection. Material having warps, crooks, and other defects shall not be incorporated into the work, even though such defects may develop after material is delivered to site.

2. PRODUCTS

A. FRAMING LUMBER
   1. Unless otherwise noted on Structural Drawings and Structural Notes concealed framing lumber shall be Douglas Fir No. 2 1450fb and 19% or less moisture content. Provide lumber species and grade as noted on structural notes in structural drawings.

B. SHEATHING
   1. Unless otherwise noted on Structural drawings and Structural Notes plywood shall be 1/2" C-D with exterior glue with Identification Index of 24/16. Provide APA rated sheathing as noted on structural notes on structural drawings. Provide fire-retardant treated plywood sheathing where indicated.

C. PLYWOOD BACKING FOR ELECTRICAL AND TELEPHONE EQUIPMENT
   1. APA C-D Plugged Int. with exterior glue, fire-retardant treated, 3/4" thick except as otherwise indicated.

D. LUMBER FOR MISCELLANEOUS USES
   1. Unless otherwise indicated, provide standard grade lumber of other works, including cant strips, nailers, blocking, and other similar members.
   2. Lumber used for exposed rafters and facias shall be Douglas Fir, free of heart center and resawn. Coordinate priming and finish as required.

E. Preservative pressure-treated lumber and plywood with water-borne preservatives to comply with AWPA C2 and C9, respectively, and with requirements indicated below:
   1. Wood for Above-Ground Use: AWPB LP-2.
   2. Treat cants, nailers, blocking, curbs, stripping and similar items in contact with roofing, flashing, and vapor barrier.
   3. Treat blocking, sleepers, and similar items in direct contact with concrete.

F. STANDARD PRODUCT ROUGH HARDWARE
   1. Simpson "Strong-Tie Connectors", unless otherwise specified, of size, type, material, suited to application shown. Prior approved substitution shall have an equal or better rating acceptable to ICC and meet requirements of the CBC. All hardware to be painted finish or hot-dip galvanized.

G. OTHER ROUGH HARDWARE
   1. Common Nails: Use unless otherwise noted on drawings. Contractor shall use galvanized or aluminum on exterior where exposed to weather and exterior covered only by paint.
   2. Screws: Use unless otherwise noted on drawings. Contractor shall use galvanized on where exposed to weather and exterior covered only by paint.
   3. Bolts and Nuts: Unless otherwise noted or specified, use unfinished American Standard. Unless otherwise noted on drawings, Contractor shall use galvanized at exterior where exposed to weather and exterior covered only by paint. Provide with matching cut or pressed steel washers for both bolts and nuts where bearing on wood, unless otherwise shown.
   4. Connectors Into Concrete or Masonry: Powder-activated fastening system prior approved equal to "Ramset" or "Hilti". Anchor shall be installed to depth of embedment recommended by manufacturer. Anchors shall be galvanized where exposed to weather. Concrete nails are not acceptable.
   5. Construction Adhesive: Adhesive shall conform to APA Specification AFG-01.
   6. Mastic: As specified in Division 06 05 00.
   7. Connector Plates: Contractor shall use galvanized at exterior where exposed to weather and covered only by paint.

H. PREFABRICATED WOOD TRUSSES
   1. See 06 17 53.

I. GLUED LAMINATED STRUCTURAL UNITS
   1. See 05 18 00.

3. EXECUTION

A. FRAMING
   1. Verify all measurements and dimensions at the job. Set framing members and assemblies accurately to required lines and levels, and to arrangements shown. Accurately and neatly cut and fit work, and strongly nail, spike, bolt or otherwise secure in place, in workmanlike manner. Erect roofs level or sloped as noted, aligned in planes except where "warping" is specifically noted. Do not splice structural wood framing members between bearing points or supports. Have capable framers do cutting, assembling, and erecting of wood members. Secure approval before cutting any wood members that may weaken structure. Do all cutting, framing and fitting necessary for accommodation of work of other trades. All blocking for structural member shall be as detailed and noted in structural drawings. Exercise due care in placing framing so that structural and other important members do not require cutting for openings, pipes, vents, conduits, ducts, or like work. Finish bearing surfaces on which wood structural members are to rest to give full, true, and even support. Do not use wedges or shims to overcome faulty work. Remove and replace wood members, which have been split or otherwise damaged to such an extent as to materially impair their strength, as directed at no extra cost to Owner. Provide wood grounds, strips and blocking, indicated or required by conditions, of thickness and shape required to receive finish materials. Provide all blocking necessary for toilet accessories. Provide wood framing for air conditioning curbs as detailed or by manufacturers standard literature.

B. CONNECTIONS
   1. Term "rough hardware" includes bolts, nails, lag screws, washers, plates, and similar items employed in erection and construction of rough work, bolt anchorages embedded in concrete to concrete trade prior to erection of forms. Provide rough hardware as shown and required to complete work, including installation of such items furnished under other sections.

C. NAILING
   1. Drive nails not closer together than 1/2 their length unless driven in drilled holes, nor closer to edge of member than 1/4 its length; drill holes slightly smaller than nail diameters when necessary to prevent splitting. Penetrate second or farther member not less than 1/2 length of

nail. Use common nails except where other nails are shown or specified. Refer to Nailing schedule in CBC unless otherwise noted in Structural Notes or Structural Drawings.

D. BOLTS AND NUTS
   1. Provide malleable or cut steel washers under heads and nuts except where bearing on steel plates or other steel attachments, or where flat-head countersunk bolts are shown. Clamp members together and bore holes of same diameter as bolts, true to line; drive bolts in place, and draw nuts up tight. Immediately prior to enclosing bolts with finish or, if left exposed, upon completion of other work, draw bolts tight again. Holes at anchor bolts embedded in concrete may be 1/16" larger than bolt diameter.

E. SCREWS
   1. Screw (do not drive) lag and wood screws into place. Bore hole to receive lag screw, first of same diameter and depth as shank, and then continue to depth equal to length of screw with diameter equal to base of thread. Screw shall penetrate a distance equal to at least 7 times diameter of screw shank into far member. Install washer under each lag screw head bearing on wood.

F. PLYWOOD SHEATHING
   1. Arrange so that no piece is less than 12" wide in either face dimension. Install with face grain across supports, end joints over joists and staggered, and provide blocking at unsupported edges as noted. Nail as noted using specified nails.
   2. Provide continuous bead of construction adhesive between wood sheathing and wood supporting member at all locations concurrent with nailing.

G. STRIPPING
   1. Provide as shown and required.

H. GROUNDS
   1. Install over lath, sizes as shown or required, secured at maximum 16" intervals, accurately set to required finish lines and planes.

I. TREATED LUMBER
   1. Contractor shall install pre-treated lumber at all locations of foundation attachment where concrete and/or masonry contacts plates or ledgers. Wherever necessary to cut, notch, dap, drill or frame treated lumber, treat newly cut or bored surfaces with two heavy coats of same preservative used in original treatment, minimum 1/4" depth of penetration.
   2. Contractor shall place all exterior wall sill plates in mastic where interior finish floor slab is installed or called to be less than 1/2" above finish floor.

END OF SECTION

PREFABRICATED WOOD JOISTS Section 06 17 33

1. GENERAL

A. RELATED DOCUMENTS AND DESCRIPTION OF WORK
   1. The work includes design, fabrication, and installation of the prefabricated wood joist system as indicated and specified. The General Conditions and Division 1 apply to this section as fully as if repeated herein. Hangers for prefabricated wood joist are specified by the Manufacturer.

B. DESIGN
   1. The joists shall be sized and detailed to fit the loads, deflection criteria, and dimensions indicated on structural drawings. The design shall be in accordance with allowable values and section properties assigned and approved by the building code and agency having jurisdiction. Verification of design of the joist by complete calculations is required.

C. QUALITY ASSURANCE
   1. The products shall be proven by testing as demonstrated either by ICC or NRB acceptance or through a test program meeting UBC Standard 25.1737 and in accordance with the provisions of ASTM D-5055.

D. SUBMITTALS:
   1. Submittal procedures and quantities are specified in Division 1.
   2. Product Data:
      a. Submit certificate of compliance for joists.
      b. Submit manufacturers recommendations on erection and installation.
      c. Shop Drawings:
         i. Submit fully detailed shop drawing showing size, type, spacing, and location of prefabricated wood joists, including blocking, bridging, and anchorage of joist required for the entire system to the City for review.
      d. Design Calculations:
         i. Submit design calculations by a licensed California Civil Engineer for the joist system to the City for review.

E. DELIVERY AND STORAGE:
   1. Prefabricated wood joists shall be handled with care during delivery, storage, and installation. Damaged joist shall not be accepted. Store joists in a vertical position and protected from weather in a dry storage space.

F. ASSEMBLY FOR FIRE RATING:
   1. The prefabricated wood joist system shall meet required fire assembly as indicated on the drawings when the joist system assembly is finished as detailed.

2. PRODUCTS

A. MATERIALS:
   1. The prefabricated wood joist shall be Trusjoist MacMillan "I" series (ICC ES-1153 or equal).
   2. Metal Connector and Hanger: As specified by Manufacturer.
   3. Blocking and Bridging:
      a. Blocking and bridging shall be provided by the joist manufacturer or provided by the contractor and approved by the joist manufacturer.
      b. Blocking, stiffeners, and bridging required for the complete joist system installation shall be provided.

B. FABRICATION:
   1. The joists shall be manufactured in a plant approved for fabrication by the building code and under supervision of an approved third party inspection agency.

C. IDENTIFICATION:
   1. Each joist shall be identified by a stamp indicating the joist type, report number, manufacturer's name, plant number, and independent inspection agency logo and evaluation report number.

3. EXECUTION

A. INSTALLATION:

1. The joists are to be erected and installed in accordance with the plans, details, any Trus Joist drawings and installation suggestions. Joist hanger shall be provided for the design load indicated.
2. Temporary construction loads which cause stresses beyond design limits are not permitted.
3. Erection bracing in addition to specified bridging is to be provided to keep the joists straight and plumb as required and to assure adequate lateral support for the individual joists and the entire system until the sheathing material has been applied.

B. The contractor will give notification prior to enclosing the joists to provide opportunity for inspection of the installation.

END OF SECTION

GLUED LAMINATED STRUCTURAL UNITS — Section 06 18 00

1. GENERAL

A. RELATED DOCUMENTS AND DESCRIPTION OF WORK
   1. The work includes the furnishing and installing of glued laminated structural units as shown and noted on the drawings and as specified. The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.
   2. Coordinate with fabrication and erection/delivery of structural steel supports for timely, installation of glue laminated units.

B. QUALITY ASSURANCE
   1. Materials, manufacturer and quality control shall be in conformance with Voluntary Product Standard, "Structural Glued Laminated Timber" (ANSI/AITC A190.1) and "California Building Code, current edition (CBC)", Standards Chapter 23.
   2. Members shall be marked with a Quality Mark indicating conformance with Product Standard, "Structural Glued Laminated Timber" (ANSI/AITC A190.1). Members to remain exposed shall not be marked however shall include a certificate of performance.

C. SUBMITTALS
   1. Submittal procedures and quantities are specified in Division 1.
   2. Product Data:
      a. Certificate of Conformance shall be provided to indicate conformance with "Structural Glued Laminated Timber" (ANSI/AITC A190.1), prior to delivery of glue laminated members to the job site.
      b. Submit manufacturer's data, specifications and installation instructions covering lumber, adhesives, fabrication process, accessories and protection.
      c. Shop Drawings: Submit fully detailed shop drawings showing size, camber, and location of glued laminated structural unit, method of truss fabrication and installation procedure, and connection details to the City for review before fabrication.
      d. Samples: Provide 30" x 12" x 12" samples as required by City.

D. DELIVERY, STORAGE AND HANDLING
   1. Keep glued laminated structural units dry during delivery, storage, handling, and erection by maintaining factory-applied protective covering in weather-tight and light-proof condition, or by applying other weathertight protection. Members that are to be left exposed are to be individually wrapped. Maintain protective covering until building enclosure is completed to extent necessary for protection, and until final finishing of exterior work is ready to proceed. Do not store units in areas of either excessively high or excessively low relative humidity; comply with manufacturer's instructions.
   2. Time delivery and installation to avoid extended on-site storage, and to avoid delaying work of other trades.

2. PRODUCTS

A. MATERIALS
   1. Lumber: Lamination shall be 2" nominal. Laminating combinations shall meet the requirements of "Structural Glued Laminated Timber", ANSI/AITC A190.1 and shall provide allowable design values as noted in structural drawings.
   2. Adhesives shall be as noted in structural drawings. All members exposed to weather shall be fabricated with wet use adhesive using heart wood selected for resistance to decay. Use non-toxic adhesive at exposed interior locations.
   3. Surface Sealer: Manufacturer's standard translucent penetrating wood sealer.
   4. End Sealer: Manufacturer's standard transparent, colorless wood sealer, effective in retarding transmission of moisture at cross-grain cuts.
   5. Species: Species shall be as noted in structural drawings.

6. All exposed glue-laminated members shall be grade stamped on the top or ends. All grade stamps within view of public shall be removed by sanding after framing inspection approval by inspector. Sanding to match finish, as specified by City.
7. All blocking at exposed locations to match adjacent exposed glue-laminated member.

B. FABRICATION
1. Comply with A190.1 in providing units indicated; where dimensions are not completely documented, provide manufacturer's standard sizes and shapes required to fulfill indicated performances.
2. Appearance Grade: Provide Premium Grade for exposed members. Putty shall not be used on exposed members.
3. Camber: Required camber for fabrication of each member is shown on drawings.
4. End Cut Sealing: Immediately after end-cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces.
5. Seal Coat: After fabrication and sanding of each unit, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit, except for treated wood where treatment has included a water repellent.
6. Factory Applied Protection: Before shipping or exposing to outdoor conditions, individually wrap each member with manufacturer's standard, opaque, durable, water-resistant, plastic-coated paper covering per AITC III recommended practice for protection of structural glued laminated timber during transit, storage and erection.
7. See additional structural requirements on general structural notes in drawings.

3. EXECUTION

A. INSTALLATION
1. A.I.T.C. or Gold Seal approved fabricator's Certificate of Conformance shall be submitted to the Building Inspector prior to installation.
2. Cutting: Avoid cutting members during erection, to greatest extent possible. Except for fastener drilling and other minor cutting, coat cuts with specified end sealer. Laminator shall show all special cuts on shop drawings and shall fabricate them in shop. The accurate drilling of holes for bolting is critical. As such, holes shall be 1/8" larger than the specified bolt. Holes shall be drilled through member from one side using a jig capable of accurately locating a straight hole perpendicular to the face of the member.
3. Provide temporary bracing of members until permanent lateral support and sheathing are in place.
4. Temporary construction loads which cause stresses beyond design limits are not permitted.
5. Members shall be installed in accordance with plans, details, manufacturer's instructions, and A.I.T.C. 108, "Standard for Heavy Timber Construction". Miscellaneous steel connectors, anchors, and accessories shall be provided as indicated. Do not drop or dump members. Use fabric or plastic slings, and protective blocking or padding with chains or cables. Protect from soiling, abrasions, and/or injury to shaped edges and/or sharp corners.
6. Install plugs over counter sunk bolt heads and nuts after framing inspection. Plugs shall match surrounding wood for color, texture and direction of grain.

B. PROTECTION
1. Do not remove wrapping on individually wrapped members until it will serve no useful purpose, including protection from weather, soiling and damage from work of other trades.
2. Coordinate removal of wrapping with finishing work specified in the Division 9 sections. Retain wrapping wherever it can serve as a painting shield.
3. Unused cut portions of the glue-lam shall be saved and rewrapped and remain on the job site for future use by City.

END OF SECTION

FINISH CARPENTRY Section 06 20 00

1. GENERAL:

A. SUMMARY:
1. General: Provide Finish Carpentry, as shown and specified per Contract Documents.
2. Lumber: Softwood and hardwood.
3. Sheet Materials: Softwood plywood.

B. REFERENCES:
1. The Engineered Wood Association (APA): Grading standards.
2. Forest Stewardship Council (FSC): "Forest Conservation Program".
3. Hardwood Manufacturers Association (HMA): Species Guide and Sustainability.
4. National Institute of Standards and Technology (NIST): NIST PS-20.
5. Scientific Certification Systems (SCS): Certification Standards.
6. California Redwood Association (CRA): Grading Standards.
7. Woodwork Institute (WI): Architectural Woodwork Standards (AWS).

C. SUBMITTALS:
1. General: Submit product data, shop drawings and samples.
2. Certificates:
   a. General: WI Certified Compliance Certificate for fabrication and installation of casework in grade specified.
   b. Hardwood:
      1. General: Submit certification and documentation verifying that hardwood lumber and veneers were obtained from sustainably managed sources and that certified lumber was properly segregated from other materials while in storage and production.
      2. Acceptable Certifying Agencies:
         a) Rainforest Alliance (RA): "Smart Wood Program".
         b) Scientific Certification Systems (SCS): Forest Stewardship Council (FSC) - "Forest Conservation Program".
3. Closeout: Submit maintenance data and guarantee.

D. QUALITY ASSURANCE: Company specialized in the products specified in this Section with a minimum of two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
1. LEED Certification Requirements:
   a. Certified Wood Products: Use only Forest Stewardship Council (FSC) certified wood products from acceptable FSC sources with Chain of Custody (CoC) documentation and number.
   b. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS-36.
2. Lumber:
   a. General:
      1. Grading: NIST PS-20 and applicable association rules under which each lumber species is produced.
      2. Moisture Content: Per WI standards; not greater than 19 percent maximum for lumber and 15 percent for plywood; air-dry or kiln-dry.
   b. Exposed Softwood: Douglas fir; WI Custom Grade.
   c. Hardwood:
      1. Window Sills: American Elm.
      2. Siding: Ipe.
3. Plywood: Douglas Fir; APA, A-C Group 1 Exterior.
4. Hardboard:
   a. General: ANSI A135.4; 1/4 inch tempered, smooth both sides; unless otherwise noted.
   b. Pegboard: Pressed wood fiber with resin binder, tempered; 1/4 inch thick with 9/32 inch holes at 1 inch on center both ways.
5. Wood Preservative Treatment: Refer to Section 06 05 00 - COMMON WORK RESULTS FOR WOOD, PLASTICS AND COMPOSITES.
6. Adhesive: CS 35-61, Type II, water-resistant.

7. Fasteners:
   a. General: Of size and type to suit application; hot dipped galvanized at concealed locations; bright finish in exposed locations; refer to Section 06 05 00 - COMMON WORK RESULTS FOR WOOD, PLASTICS AND COMPOSITES.
   b. Redwood: Stainless steel at exterior; hot dipped galvanized at interior and concealed locations.
   c. Concealed Joint Fasteners: Threaded steel.
8. Caulking Compound: Per Section 07 92 10 - JOINT SEALERS.

B. FABRICATION:
1. General: Comply with WI requirements for moisture content at time of fabrication.
2. Millwork:
   a. General: Manufacture to AWS Custom Grade standards, except where specifically noted otherwise. Mill to dimensions and profiles shown. Provide long lengths for field cutting and fitting.
   b. Exterior: Per AWS.
   c. Interior: Per AWS. Mill reverse side of material ("back-out") when lumber is over 5/8 inch thick and more than 1-5/8 inch wide.

3. EXECUTION:

A. PREPARATION:
1. Environmental Requirements: Do not install interior finish work until building is closed, temperature can be maintained above 50 degrees F and all plaster is dry.
2. Examination: Examine conditions of work in place before beginning work; report defects.
3. Measurements: Take field measurements; report variance between plan and field dimensions.
4. Protection: Per Section 01 43 00 - QUALITY ASSURANCE.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Millwork:
   a. General: Do not install millwork until wet operations are complete, with concrete, masonry and plaster work thoroughly dry, and millwork has been primed or sealed under Section 09 91 00 - PAINTING. Reseal cut edges, surfaces and ends as required.
   b. Exterior:
      1. General: Exposed surfaces shall be free from tool marks, torn grain, cross sanding, or workmanship defects that cannot be concealed by specified painter's finish.
      2. Plywood: Install with grain texture vertical; edges and ends occurring only over bearings.
   c. Interior:
      1. General: Install plumb, square and true, securely wedged and anchored to structure. Countersink face nails.
      2. Plywood: Install with joints bearing on studs or solid backing. Slightly bevel adjoining panel edges by sanding before installation. Finish nail around perimeter and at studs; set nails.
      3. Hardboard:
         a) General: As shown; set nails.
         b) Pegboard: Over gypsum board, as shown; minimum 1/4 inch space between pegboard and gypsum board for use of hangers.
   d. Trim Members:
      1. General: Install level, plumb and true, with members neatly and accurately scribed in place. Install standing trim in single lengths, running trim in as long lengths as practical for species specified. Butt joints beveled together, exterior angles mitered, interior angles coped.
      2. Exterior: Redwood, unless otherwise shown.
      3. Interior: Douglas fir and hardwood where shown.
   e. Nailing:
      1. Exterior:
         a) Trim: 10d nails or less, use finish nails set 1/16 inch without putty; 10d nails or over, use galvanized common nails driven flush without hammer marks or putty.
         b) Plywood: Nails long enough to penetrate structure per CBC requirements. Use galvanized nails, driven flush without hammer marks.
      2. Interior:
         a) Trim: Set nails 1/16 inch, minimum; no putty where clear finish is scheduled.
         b) Plywood: As shown, set nails 1/16 inch, minimum.

f. Site Applied Wood Treatment: Apply preservative treatment in accordance with manufacturer's instructions. Brush apply two (2) coats of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings. Treat site-sawn cuts and drilled holes. Allow preservative to dry prior to erecting members.

* * *

WOOD VENEER CASEWORK Section 06 41 14

1. GENERAL:

A. SUMMARY: Provide Wood Veneer Casework, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturer's standard specifications.
   2. The Engineered Wood Association (APA): Grading standards.
   3. Builders Hardware Manufacturers Association (BHMA): BHMA A156.9 - Cabinet Hardware.
   4. Hardwood Manufacturers Association (HMA): Species Guide and Sustainability.
   5. Hardwood Plywood and Veneer Association (HPVA): ANSI/HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.
   6. National Institute of Standards and Technology (NIST): NIST PS-20
   7. National Electrical Manufacturers Association (NEMA): NEMA LD3 - High Pressure Decorative Laminates.
   8. Woodwork Institute (WI): Architectural Woodwork Standards (AWS).
C. SUBMITTALS:
   1. General: Submit product data.
   2. Shop Drawings: Submit manufacture and installation details, including fastenings, with WI Certified Compliance Label on drawings for review.
   3. Samples:
      a. General: Manufacturer's standard plastic laminate colors; other products if specifically requested.
      b. Wood Finishes: Submit three (3) samples of each identified wood species, finished as specified.
   4. Certificates:
      a. General: WI Certified Compliance Certificate for fabrication and installation of casework in grade specified.
      b. Hardwood:
         1. General: Submit certification and documentation verifying that hardwood lumber and veneers were obtained from sustainably managed sources and that certified lumber was properly segregated from other materials while in storage and production.
         2. Acceptable Certifying Agencies:
            a) Rainforest Alliance (RA): "Smart Wood Program".
            b) Scientific Certification Systems (SCS): Forest Stewardship Council (FSC) "Forest Conservation Program".
   5. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE: Fabricator and installer having minimum of two (2) years experience with WI requirements of grade specified.

2. PRODUCTS:

A. MATERIALS:
   1. Lumber:
      a. Softwood Lumber: Douglas fir.
      b. Hardwood Lumber:
         1. General: FS MM-L-736; provide from certified, sustainably managed sources.
         2. Species: Birch.
   2. Plywood:
      a. Hardwood Plywood:
         1. General: Provide hardwood veneers from certified, sustainably managed sources.
         2. Species: Birch.
         3. Core: Lumber with exterior glue.
         4. Veneer Cut: Plain sliced.
         5. Veneer Matching:
            a) Individual panels: Slip matched.
            b) Architectural Plywood: Sequence matched.
   3. Plastic Laminate: Refer to Section 06 41 17 - PLASTIC LAMINATE VENEER CASEWORK.
   4. Solid Plastic Countertops: Refer to Section 06 64 20 - PLASTIC PANEL FABRICATIONS.
   5. Casework Hardware:
      a. General: Per AWS, BHMA A156.9, and as follows:
      b. Finish: Exposed hardware; stainless steel (SS).

c. Hinges:
   1. General: Model No. RP374-26D, manufactured by Rockford Process Control, Inc.
   2. Alternate Manufacturers: Comparable products manufactured by the Stanley Hardware Division of the Stanley Works, or approved equal.
d. Door and Drawer Pulls:
   1. General: Model No. AS54-128SS manufactured by the Engineered Products Co. (EPCO).
   2. Alternate Manufacturers: Comparable products manufactured by Häfele America Co., or approved equal.
e. Magnetic Catches:
   1. General: No. 592 manufactured by the Engineered Products Co. (EPCO).
   2. Alternate Manufacturers: Comparable products manufactured by the Ives Division of IR Security & Safety, or approved equal.
f. Silencers:
   1. General: Silencers manufactured by Ceco Building Systems Division of Robertson-Ceco.
   2. Alternate Manufacturers: Comparable products manufactured by North American Door Corp. (NADCOR), or approved equal.
g. Locks:
   1. General: Small Pin manufactured by the Olympus Lock, Inc.; provide unit for cylinders as specified in Section 08 71 00 - DOOR HARDWARE.
   2. Alternate Manufacturers: Comparable products manufactured by National Cabinet Lock, or approved equal.
h. Cam Locks:
   1. General: Padlockable Cam Lock manufactured by the Padlockable Cam Lock Division of FJM Security; padlocks as specified in Section 08 71 00 - DOOR HARDWARE.
   2. Alternate Manufacturers: Comparable products manufactured by Rockler Companies, Inc., or approved equal.
i. Drawer Guides:
   1. General: Manufactured by Accuride International, Inc.
   2. Alternate Manufacturers: Comparable products manufactured by the Knape and Vogt Manufacturing Co, or approved equal.
   3. Small Drawer: Model No. 2037; 75 lbs.
   4. Self Closing Medium Drawer: Model No. 7432SC; 100 lbs.
   5. Self Closing Large Drawer: Model No. 3832HDSC; 150 lbs.
   6. Bed Drawers: Model No 9301 - 30 inch Extra Heavy-Duty Full-Extension.
j. Adjustable Shelf Hardware:
   1. General: Manufactured by Knape and Vogt Manufacturing Co.
   2. Alternate Manufacturers: Comparable products manufactured by the Stanley Hardware Division of the Stanley Works, or approved equal.
   3. Brackets: Model No. 255 Pilasters, steel.
   4. Supports: Model No. 256 Pilaster Supports, steel.
k. Hole Plugs:
   1. General: 2 inch diameter 26 Series manufactured by Outwater Plastic Industries, Inc.; color selected by the City Representative.
   2. Alternate Manufacturers: Comparable products manufactured by the Stanley Hardware Division of the Stanley Works, or approved equal.
l. Heavy Duty Casters:
   1. General: Manufactured by Tente USA; provide hard casters for use on carpet and soft casters for use on hard flooring.
   2. Alternate Manufacturers: Comparable products manufactured by the Master Manufacturing Co., or approved equal.
   3. Fixed: Model No. 7478XSC100P50
   4. Swivel: Model No. 7477XSC100P30-13
   5. "U" Bracket: Model No. PW20 NS manufactured by the Master Manufacturing Co., or approved equal.
m. Sliding Waste Container: Model 5349-15DM18-1SS manufactured by Rev-A-Shelf, or approved equal.

6. Fasteners and Adhesives: Per WI requirements; refer to Section 06 05 00 - COMMON WORK RESULTS FOR WOOD, PLASTICS AND COMPOSITES.
7. Finish Materials:
   a. General: Per AWS requirements.
   b. Stain: Compatible with finish material; color selected by the City Representative.
   c. Finish: Water reducible acrylic lacquer; semi-gloss.

B. FABRICATION:
1. General: Manufacture to AWS Premium Grade standards, except where specifically noted otherwise. Provide WI Certified Compliance Label for grade specified, to each elevation of casework.
2. Construction:
   a. General: Completely face all exposed and semi-exposed surfaces, with specified hardwood species. As far as practical, fabricate casework complete as a unit in the shop; backs required.
   b. Type: Style A Frameless.
   c. Door and Drawer Fronts: Cabinet door solid hardwood.
   d. Shelves: Plastic laminate over 3/4 inch exterior plywood with 1-1/4 inch hardwood front and rear edge bands.
   e. Filler Panels: As required; to match cabinets as shown.
   f. Finish: Factory finish exposed, interior and semi-exposed surfaces, including drawer interiors, backs, sides and bottoms, and related wood trim, to AWS Premium Grade standards.
3. Countertops:
   a. Plastic Laminate: Refer to Section 06 41 17 - PLASTIC LAMINATE VENEER CASEWORK.
   b. Solid Plastic: Refer to Section 06 64 20 - PLASTIC PANEL FABRICATIONS; fabricate to shapes as shown, per manufacturer's directions.
   c. Metal Countertops: Refer to Section 07 60 00 - FLASHING AND SHEET METAL.
4. Hardware:
   a. General: Prefit; remove for application of finish. Keep hardware with casework to which it has been prefit; reinstall after installation of unit at job site.
   b. Hinges: Four (4) No. 8 screws into end panel and door panel; 1-1/2 pair on 7'-0" high cabinet doors; tall cabinet doors must swing 180 degrees when adjacent to low cabinets without interference from counter top.
   c. Drawer and Door Pulls: Comply with CBC 1125 B.4.
   d. Magnetic Catches: One catch on cabinet doors up to 48 inches high; two catches (top and bottom) on cabinet doors over 48 inches high.

3. EXECUTION:

A. PREPARATION:
1. Scheduling: Coordinate placement of blocking and reinforcement in walls supporting casework.
2. Environmental Requirements: Relative humidity 50% or less; temperature 70 degrees F minimum.
3. Examination: Examine conditions of work in place before beginning work; report defects. Verify the placement of plumbing and electrical service required by built-in equipment and accessories shown.
4. Measurements: Take field measurements prior to fabrication; report variance between plan and field dimensions.
5. Delivery: Use clean, nonstaining materials for blocking and packing. Carefully load and cover for shipment; do not transport during inclement weather.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Casework:
   a. General: Install level, with tight joints between units; scribe edges to fit adjacent structure. Use concealed joint fasteners to align and secure adjoining cabinet units, counter tops and support brackets. Secure to blocking or plates in wall or to casework carriers with lag bolts with washers to permit removal. Screws shall penetrate not less than 1 inch into 2 inch nominal blocking or framing.
   b. Filler Panels: Scribe to cabinets and abutting structure.
3. Countertops:
   a. General: Install level, using concealed fasteners, with tight joints; scribe to fit wall surfaces.
   b. Plastic Laminate: As shown; refer to Section 06 41 17 - PLASTIC LAMINATE VENEER CASEWORK.
   c. Solid Plastic: As shown, per Section 06 64 20 - PLASTIC PANEL FABRICATIONS.
   d. Metal Countertops: Refer to Section 07 60 00 - FLASHING AND SHEET METAL.
4. Hardware:
   a. General: Check hardware upon delivery to site; store in an orderly manner. Fit and install in place without marring or injuring either hardware or casework.
   b. Seismic Restraint: As shown.

5. Finish: Touch-up and repair to factory-applied condition.

* * *

PLASTIC LAMINATE VENEER CASEWORK Section 06 41 17

1. GENERAL:

A. SUMMARY: Provide Plastic Laminate Veneer Casework, as shown and specified per Contract Documents.

B. REFERENCES:
1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
2. The Engineered Wood Association (APA): Grading standards.
3. Builders Hardware Manufacturers Association (BHMA): BHMA A156.9 - Cabinet Hardware.
4. National Institute of Standards and Technology (NIST): PS-20.
5. National Electrical Manufacturers Association (NEMA): NEMA LD3 - High Pressure Decorative Laminates.
6. Woodwork Institute (WI): Architectural Woodwork Standards (AWS).

C. SUBMITTALS:
1. General: Submit product data and samples.
2. Shop Drawings: Submit manufacture and installation details, including fastenings, for review. Provide WI Certified Compliance Label.
3. Certificates: Submit WI Certified Compliance Certificate for fabrication and installation of all casework in grade specified.
4. Closeout: Submit maintenance data and guarantee in required form for a period of two (2) years from date of final acceptance by Owner.

D. QUALITY ASSURANCE: Fabricator and installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
1. LEED Certification Requirements:
   a. Certified Wood Products: Use only Forest Stewardship Council (FSC) certified wood products from acceptable FSC sources with Chain of Custody (CoC) documentation and number.
   b. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS-36.
2. Plastic Laminate:
   a. General: Class I high-pressure decorative laminate plastic manufactured by Pionite Decorative Surfaces; UBC Class II flame spread.
   b. Alternate Manufacturers: Comparable products manufactured by the Formica Corp., or approved equal.
   c. Plastic Veneer: NEMA Standard .039 inch postforming grade and .045 inch general purpose grade; satin finish.
   d. Backing Sheets and Interior Cabinet Surfaces: .020 inch thick standard laminate.
   e. Colors and Patterns: As shown.
3. Hardwood Plywood:
   a. General: FSC PlybooStrand manufactured by the Smith and Fong Co., or approved equal.
   b. Thickness: As shown.
   c. Finish: Neopolitan and Amber, where shown.
4. Solid Phenolic Core Panels:
   a. General: DEBO Phenolic Resin Sheet manufactured by Shenzhen Risewell Industry Co., Ltd., or approved equal.
   b. Thickness: As shown.
   c. Color and Pattern: As selected by the City Representative.
   d. Flame Spread: UL 723, Class 1; 25 to 200.
5. Solid Plastic Countertops: Refer to Section 06 64 20 - PLASTIC PANEL FABRICATIONS.
6. Lumber: AWS Premium Grade standards; particleboard and MDF not permitted.
7. Casework Hardware: Refer to Section 06 41 14 - WOOD VENEER CASEWORK.
8. Fasteners and Adhesives: Per WI requirements; refer to Section 06 05 00 - COMMON WORK RESULTS FOR WOOD, PLASTICS AND COMPOSITES.

B. FABRICATION:
1. General: Manufacture to AWS Custom Grade standards, except where specifically noted otherwise, per AWS. Provide WI Certified Compliance Label for grade specified, to each elevation of casework.
2. Construction:
   a. General: Completely face exposed and semi-exposed surfaces, with plastic laminate. As far as practical, fabricate casework complete as a unit in the shop; backs required.
   b. Type: Style A Frameless.
   c. Door and Drawer Fronts: Cabinet door Interface Style 1- Overlay, unless otherwise shown.
   d. Phenolic Door Fronts and Drawer Boxes: Provide where shown.
   e. Shelves: Plastic laminate faced plywood.
   f. Filler Panels: As required; to match cabinets as shown.
3. Countertops:
   a. General: Fabricate per AWS, Assembly 2 - Deck Mount, manufacturer assembled, as shown. Provide in longest practicable length; minimize number of joints. Make joints neat and watertight; abutting ends splined and adjoining surfaces flush; ease exposed edges. Provide backing sheet on bottom side of countertops where plumbing fixtures are to be installed or where exposed to moisture. Core thickness as shown; not less than 3/4 inch.
   b. Solid Plastic: Refer to Section 06 64 20 - PLASTIC PANEL FABRICATIONS; fabricate to shapes as shown, per manufacturer's directions.
   c. Metal Countertops: Refer to Section 07 60 00 - FLASHING AND SHEET METAL.
4. Casework Hardware:
   a. General: Prefit; remove for application of finish. Keep hardware with casework to which it has been prefit; reinstall after casework is anchored in place, as shown.
   b. Hinges: Four (4) No. 8 screws into end panel and door panel; 1-1/2 pair on 7'-0" high cabinet doors; tall cabinet doors must swing 180 degrees when adjacent to low cabinets without interference from counter top.
   c. Drawer and Door Pulls: Comply with CBC 1125 B.4.
   d. Magnetic Catches: One catch on cabinet doors up to 48 inches high; two catches (top and bottom) on cabinet doors over 48 inches high.

3. EXECUTION:

A. PREPARATION:
1. Scheduling: Coordinate placement of blocking and reinforcement in walls supporting casework.
2. Environmental Requirements: Relative humidity 50% or less; temperature 70 degrees F minimum.
3. Examination: Examine conditions of work in place before beginning work; report defects. Verify the placement of plumbing and electrical service required by built-in equipment and accessories shown.
4. Measurements: Take field measurements prior to fabrication; report variance between plan and field dimensions.
5. Delivery: Use clean, nonstaining materials for blocking and packing. Carefully load and cover for shipment; do not transport during inclement weather.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified. Provide WI Certified Compliance Certificate for Installation.
2. Casework:
   a. General: Install level, with tight joints between units; scribe edges to fit adjacent structure. Use concealed joint fasteners to align and secure adjoining cabinet units, counter tops and support brackets. Secure to blocking or plates in wall or to casework carriers with lag bolts with washers to permit removal; screw penetration of not less than 1 inch into 2 inch nominal blocking or framing is required.
   b. Filler Panels: Scribe to cabinets and abutting structure.
3. Countertops:
   a. General: Install level, using concealed fasteners, with tight joints; scribe to fit wall surfaces.
   b. Solid Plastic: As shown, per Section 06 64 20 - PLASTIC PANEL FABRICATIONS.
   c. Metal Countertops: Refer to Section 07 60 00 - FLASHING AND SHEET METAL.
4. Hardware:
   a. General: Check hardware upon delivery to site; store in an orderly manner. Fit and install in place without marring or injuring either hardware or casework.
   b. Seismic Restraint: As shown.

C. ADJUSTMENT: Prior to acceptance, adjust moveable parts to assure smooth operation.

D. CLEANING: Immediately following installation, clean casework to remove dirt, stains, scratches, and abrasions. Protect casework against damage by other trades; repair or replace damaged and defaced material at no cost to Owner.

E. JOBBING Six (6) months after final acceptance of the building, and at any time within a year after acceptance when so directed, examine casework doors, drawers, fittings, etc., and perform such fitting and adjustment as necessary to put items in good condition and working order.

* * *

PLASTIC PANEL FABRICATIONS Section 06 64 20

1. GENERAL:

A. SUMMARY: Provide Plastic Panel Fabrications, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American National Standards Institute (ANSI): Standards.
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   3. International Surface Fabricators Association (ISFA): ISSFA-2 Classifications and Standards for Solid Surfacing Materials
   4. National Electrical Manufacturers Association (NEMA): Standards.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
   3. Maintenance Data: Manufacturer's instructions; provide maintenance kit for matte finishes.
D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Solid Surfacing Material:
      a. General: Corian manufactured by the DuPont Corian Solid Surfaces, or approved equal.
      b. Thickness and Size: As shown.
      c. Color: Selected by the City Representative.
      d. Finish: Matte exposed surfaces.
      e. Edge Treatments: As shown.
      f. Adhesive: Manufacturer's standard.
      g. Fasteners: As recommended by manufacturer; refer to Section 06 05 00 - COMMON WORK RESULTS FOR WOOD, PLASTICS AND COMPOSITES.
   2. Sealant: Refer to Section 07 92 10 - JOINT SEALERS.
B. FABRICATION:Shop fabricate to shapes and sizes shown.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
   3. Delivery: Deliver no components to project site until areas are ready for installation; store indoors.
   4. Protection: Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of Project.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Components:
      a. General: Install plumb, level and rigid, scribed to adjacent finishes.
      b. Tolerances:
         1. Variation in Component Size: +1/8 inch.
         2. Location of Openings: ±1/8 inch from indicated location.

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FIBERGLASS REINFORCED PANELS Section 06 83 16

1. GENERAL:

A. SUMMARY: Provide Fiberglass Reinforced Panels, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American National Standards Institute (ANSI): ANSI/ISO 820 - Particle boards - Definition and Classification.
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings, color and texture samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS- 36.
   2. F.R.P. (Fiberglass Reinforced Polyester) Panels:
      a. General: Standard integral color FRP Panels with smooth gloss finish manufactured by the Marlite Corp.; ASTM E84, Class 1/A flame spread of 25 and smoke generation of 450, maximum; color as selected by the City Representative.
      b. Alternate Manufacturers: Comparable products manufactured by Glasteel, Inc., or approved equal.
      c. Moldings and Trim: Manufacturer's standard clear anodized Inside Corner, Outside Corner, Division and Edge Aluminum trim as required for condition as shown.
      d. Adhesive and Sealant: As recommended by the manufacturer for substrate shown.
   3. Fasteners: Concealed type as recommended by the manufacturer; refer to Section 06 05 00 - COMMON WORK RESULTS FOR WOOD, PLASTICS AND COMPOSITES.

3. EXECUTION:

A. PREPARATION:
   1. Environmental Requirements: Relative humidity of 50% or less; minimum temperature of 70 degrees F.
   2. Examination: Examine conditions of work in place before beginning work; report defects.
   3. Measurements:
      a. General: Take field measurements; report variance between plan and field dimensions.
      b. Stud Spacing: Verify that backing is installed as required.
   4. Product Handling: Deliver F.R.P. Panels flat, on skids; store inside, out of weather and exposure to sunlight. Re-stack panels 24 hours prior to installation, on solid flat surface to minimize package distortion.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. F.R.P. Panels:
      a. General: Adhesive apply per manufacturer's instructions; apply sealant as required.
      b. Moldings and Trim: Install as shown.

* End Division 06 *

Division 07 - THERMAL & MOISTURE PROTECTION

ELASTOMERIC SHEET WATERPROOFING Section 07 13 53

1. GENERAL:

A. SUMMARY: Provide Sheet Waterproofing, as shown and specified per Contract Documents.

B. REFERENCES:

1. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   b. ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials.
   c. ASTM E154: Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
   d. ASTM C836: Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
   e. ASTM D903: Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
   f. ASTM D1876: Standard Test Method for Peel Resistance of Adhesives (T-Peel Test).
   g. ASTM D1970: Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
   h. ASTM D5385: Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.
2. National Roofing Contractors Association (NRCA): NRCA Waterproofing Manual.
3. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.

C. SUBMITTALS:

1. General: Submit samples.
2. Product Data: Submit manufacturer's specifications, data, and installation instructions for review. Include data indicating VOC content.
3. Certificates: Certify that membrane meets or exceeds specified requirements.
4. Closeout: Submit maintenance data and guarantee in required form for a period of two (2) years from date of final acceptance by Owner.

D. QUALITY ASSURANCE:

1. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience; manufacturer approved. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
2. Pre-application Job-site Conference: Scheduled by applicator with one week advance notice; to be attended by applicator, his working foreman, City Representative, and waterproofing material manufacturer's agent. Discuss requirements of related work surface preparation, storage and handling, protection measures, materials and application specifications.

2. PRODUCTS:

A. MATERIALS:

1. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS- 36.
2. Sheet Waterproofing:
   a. General: Specified products are manufactured by the Chargar Corporation.
   b. Alternate Manufacturers: Comparable products manufactured by Grace Construction Products, or approved equal.
   c. Waterproofing System:
      1. General: Duramem 700-SM.
      2. Primer: VOC compliant, as recommended by the manufacturer.
      3. Elastomeric Sheet Membrane: 60 mils thick.
3. Sheet Drain: Dura Drain Soil Sheet Drain, as recommended by manufacturer.
4. Protection Board: As recommended by the manufacturer; thickness as shown.
5. Sealant: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
1. Environmental Requirements: Temperature above 50 degrees F. during installation and curing.
2. Examination: Examine conditions of work in place before beginning work; report defects.
3. Measurements: Take field measurements; report variance between plan and field dimensions.
4. Protection: Protect work exposed to view from damage during application and backfilling.
5. Surface Preparation: Prepare surfaces to receive waterproofing per manufacturer's instructions. Seal penetrations, small cracks and other imperfections in substrate.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Primer: Apply brush or spray coat to surfaces as recommended by manufacturer.
3. Reinforcing: Reinforce membrane angles at footings, corners or offsets and around knock-out panels with an extra application of emulsion and glass fabric.
4. Waterproofing Membrane: As shown, per manufacturer's recommendations. Roll surface to remove wrinkles and assure adhesion.
5. Sheet Drain: As shown, per manufacturer's recommendations.
6. Protection Board: Install to within 6 inches of top of finish grade; brace to hold in place during backfilling.

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ELASTOMERIC DECK COATING Section 07 18 00

1. GENERAL:

A. SUMMARY: Provide Elastomeric Deck Coating, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data, and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience; manufacturer approved. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Elastomeric Deck Surface:
      a. General: Elasto-Deck 6500PT manufactured by Pacific Polymers International, Inc.; color selected by the City Representative.
      b. Alternate Manufacturers: Comparable products manufactured by BASF Building Systems, or approved equal.
      c. Sealant: Elasto-Thane 230.
      d. Primer: Elasto-Poxy.
      e. Coating: Elasto-Deck 6500PT two component, flexible, low-odor polyurea deck coating.
      f. Sheet Flashing: .050 inch thick, pre cured, commercial grade neoprene.
      g. Flashing Tape: As recommended by manufacturer.
      h. Aggregate: 20 mesh sand.

3. EXECUTION:

A. PREPARATION:
   1. Environmental Requirements: Do not apply during inclement weather or when temperature is below 40 degrees F., or greater than 90 degrees F.
   2. Examination: Examine conditions of work in place before beginning work; report defects.
   3. Measurements: Take field measurements; report variance between plan and field dimensions.
   4. Protection: Provide control barriers to restrict traffic in work area during installation and curing. Protect adjacent surfaces; repair or replace work damaged by operations under this Section.
   5. Surface Preparation:
      a. General: Assure that surfaces are dry and completely cleaned of foreign materials.
      b. Concrete: Remove dirt, oil, laitance and other contamination by acid etch, sandblasting, scarification or hot detergent cleaner.
      c. Wood: Assure that deck is well fitted, blocked and fastened with flat head screws or ring shank nails.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Coating System: Calk, reinforce and prepare joints to level condition; apply flashing and apply primer, per manufacturer's instructions. Apply base and intermediate coats to 25 mil thickness each coat. Apply color top coat; cure per manufacturer's instructions.

* * *

WATER REPELLENTS Section 07 19 00

1. GENERAL:

A. SUMMARY: Provide Water Repellents, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
C. SUBMITTALS:
   1. General: Submit product data, samples, and jurisdictional VOC compliance certificate.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of five (5) years from date of final acceptance by Owner.
D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience; manufacturer approved. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. VOC Materials Compliance:
      a. General: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and the following:
      b. Waterproofing Sealers: Green Seal Standard GS-47.
   2. Water Repellents:
      a. General: Siloxane PD manufactured by ProSoCo, Inc.
      b. Alternate Manufacturers: Comparable products manufactured by the BASF Building Systems, or approved equal.
   3. Cleaning Materials: As recommended by the manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Scheduling: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.
   2. Environmental Requirements:
      a. General: Do not apply water repellent under the following conditions:
         1. Temperature: Ambient or substrate surface temperature is less than 40 degrees F or inclement weather or temperatures below 40 degrees F are predicted within 24 hours.
         2. Moisture: Minimum 24 hours after surfaces have been wet.
      b. Windy Conditions: Do not apply when conditions may cause water repellent to be blown onto vegetation or surfaces not intended to be coated.
   3. Examination: Examine conditions of work in place before beginning work; report defects.
   4. Surface Preparation:
      a. General: Clean application surfaces of substances that might interfere with penetration or performance of water repellents. Test for moisture content and pH level per manufacturer's instructions.
      b. Concrete: Remove oil, curing compounds, laitance, and other substances that could prevent adhesion or penetration of water repellents.
      c. Brick Masonry: Clean clay brick masonry per ASTM D5703.
   5. Test Application: Pretest the water repellent material on a 3'-0" x 3'-0" section of the masonry and concrete to ensure stability and desired results.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Application:
      a. General: Use low-pressure spray equipment. Comply with manufacturer's instructions for using airless spraying procedure, unless otherwise indicated.
      b. First Coat: Apply heavy-saturation spray coating of water repellent on surfaces indicated for treatment.
      c. Drying Time: Per manufacturer's directions.
      d. Second Coat: Apply saturation spray coating, repeating first application.

3. Overspray: Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application, as work progresses. Repair damage caused by water-repellent application.

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THERMAL INSULATION Section 07 21 00

1. GENERAL:

A. SUMMARY:
1. General: Provide Thermal Insulation, as shown and specified per Contract Documents.
2. Types: Batt insulation.

B. REFERENCES:
1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
2. North American Insulation Manufacturers Association (NAIMA): Manufacturing standards.
3. Underwriters Laboratories, Inc. (UL): UL 723 - Tests for Surface Burning Characteristics of Building Materials.
4. California Building Code (CBC): Standard 8-1.

C. SUBMITTALS:
1. General: Submit product data, samples, and certification that insulating materials comply with California Quality Standards for insulating materials.
2. Closeout:
   a. General: Submit maintenance data.
   b. Guarantee: Submit maintenance data and required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
1. Manufacture:
   a. General: Formaldehyde free, regionally manufactured products are manufactured by Owens Corning, unless otherwise noted.
   b. Alternate Manufacturers: Comparable products manufactured by the Johns-Manville Corp., or approved equal.
   c. Recycled Metal Content: Use materials with recycled content of at least 20%.
   d. Thickness: As shown; where not shown, as needed to meet CBC requirements as indicated on T-24 calculations shown on Drawings to exceed minimum CBC requirements.
2. Batt Insulation:
   a. General:
      1. Thermal: Thermal Batts Insulation, unfaced; ASTM C665 Type I; ASTM E84, flame spread 10, smoke developed 10.
      2. Fire Rated: Flame Spread 25 Insulation, FSK-faced; ASTM C665, Type III, Class A; ASTM E84 flame spread of 25, smoke developed of 50.
   b. Suspended Ceilings: Sonobatts, unfaced; ASTM C665 Type I; ASTM E84, flame spread 10, smoke developed 10.
3. Sound Insulation:
   a. General: Quiet Zone Sound Attenuation Batt Insulation; ASTM C665, Type 1.
   b. Fire Rated: Fire Rated Sound Attenuation Batt Insulation; ASTM C665, Type 1, and ASTM E119.
4. Vinyl Faced Insulation:
   a. General: CertaPro White Poly Scrim Kraft (PSK) Extended Flange Batts manufactured by the CertainTeed Corp., Insulation Group.
   b. Alternate Manufacturers: Comparable products manufactured by the Lamtec Corp., or approved equal.
5. Fasteners:
   a. Mechanical:
      1. General: As recommended by manufacturer, for application as shown.
      2. Staples: 7/16 inch wire staples.
      3. Nails: 11 gage, barbed, galvanized; 5/8 inch diameter heads.
   b. Wire:
      1. General: 16 or 18 gage steel.
      2. Supports: As recommended by manufacturer.
   c. Adhesive: As recommended by manufacturer.
   d. Tape: As recommended by manufacturer, for application shown.
6. Sealants: Per Section 07 92 10 - JOINT SEALERS.

3. EXECUTION:

A. PREPARATION: Examine conditions of work in place before beginning work; report defects.

B. INSTALLATION:
1. General: Install at exterior walls; ceilings below roof areas, where shown; and other locations,

including above suspended ceilings, in strict conformance with referenced standards, the manufacturer's written directions, and as shown. Install wall and ceiling insulation to create complete thermal enclosure around habitable space.

2. Batt Insulation:
   a. Ceilings:
      1. General: Install with friction fit at sides and firmly butted ends without gaps or voids.
      2. Suspended Ceilings: Place on top of suspended ceiling materials, excluding light fixtures. Fit snugly between ceiling supports and at edges and ends to minimize air leaks; extend 12 inches beyond wall lines of rooms to be insulated. Where walls or plenum barriers extend above ceiling, place 12 inch width of batt on opposite side, adjacent to wall or plenum barrier.
   b. Stud Walls: Install with friction fit at sides and firmly butted ends without gaps or voids; attach faced insulation to studs at 4 inches on center; minimize air leaks.
3. Sound Insulation: Friction fit to cavity where shown at interior walls.
4. Vinyl Faced Insulation: Per manufacturer recommendations.

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MINERAL FIBER CEMENT SIDING Section 07 46 46

1. GENERAL:

A. SUMMARY: Provide Mineral Fiber Cement Siding, as shown and specified per Contract Documents.

B. REFERENCES:

1. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   b. ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
   c. ASTM E84: Test Method for Surface Burning Characteristics of Building Materials.
   d. ASTM E136: Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.
   e. ASTM C1186: Standard Specification for Grade II, Type A, Non-Asbestos Fiber-Cement Flat Sheets.
2. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.

C. SUBMITTALS:

1. General: Submit product data, shop drawings and samples.
2. Closeout: Submit maintenance data.
3. Guarantee:
   a. General: Submit in required form.
   b. Products: Fifty (50) years from date of final acceptance by Owner.
   c. Installation: Two (2) years from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:

1. Fiber Cement Panels:
   a. General: Manufactured by James Hardie Building Products, Inc.
   b. Alternate Manufacturers: Comparable products manufactured by Allura, or approved equal.
   c. Siding: HardiePanel Siding, Smooth; exposure as shown.
   d. Color: As selected by City Representative.
2. Fasteners: As recommended by manufacturer.
3. Sealant: As recommended by manufacturer; refer to Section 07 92 10 - JOINT SEALERS.

3. EXECUTION:

A. PREPARATION:

1. Examination: Examine conditions of work in place before beginning work; report defects. Verify that weather resistive barrier is properly in place and ready for application of siding.
2. Measurements: Take field measurements; report variance between plan and field dimensions.
3. Delivery: Store flat; keep covered and dry prior to installation.

B. INSTALLATION:

1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Siding: Install in continuous lengths; where butt end joining is required, set siding in bed of sealant as recommended by manufacturer.
3. Soffits: Install as shown.
4. Trim: Refer to Section 06 20 00 - FINISH CARPENTRY.

* * *

THERMOPLASTIC MEMBRANE ROOFING Section 07 54 00

1. GENERAL:

A. SUMMARY: Provide Thermoplastic (TPO) Membrane Roofing, as shown and specified per Contract Documents.

B. REFERENCES:
1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
2. Intertek Testing Services (ITS): Fastening requirements.
3. National Roofing Contractors Association (NRCA):
   a. General: NRCA Roofing and Waterproofing Manual.
   b. Membrane Roofing: NRCA Roofing Manual - Membrane Roof Systems.
4. Single-Ply Roofing Institute (SPRI): Wind Design Guide for Single-ply Roofing Systems.
5. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.

C. SUBMITTALS:
1. General: Submit product data, shop drawings and samples.
2. Closeout:
   a. General: Submit maintenance data and guarantee in required form for a period of thirty (30) years from date of final acceptance by Owner. Guarantee covering necessary repairs, up to and including full replacement costs, as required, regardless of cost.
   b. Reflectance Warranty: Provide in required form for a period of ten (10) years at no additional cost.

D. QUALITY ASSURANCE:
1. Qualifications:
   a. General: Factory trained and approved applicator; with a minimum of two (2) years experience installing the single-ply roofing system. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
   b. Applicator-Manufacturer Review: Provide Drawings and Specifications review by Applicator with agent of roofing manufacturer; obtain manufacturer's agreement that specified system is proper for application shown.
   c. Pre-Application Job-Site Conference: Arranged by Applicator, with a minimum of one (1) week advance notice; for review of storage, handling, protection, surface preparation, materials and application specifications; attended by Applicator, his foreman, City Representative and manufacturer's agent.

2. PRODUCTS:

A. MATERIALS:
1. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS- 36.
2. Thermoplastic Polyolefin (TPO) Membrane Roofing:
   a. General: Mechanically Attached Sure Weld Roofing System manufactured by Carlisle SynTec Inc., Div. of Carlisle Corp.
   b. Alternate Manufacturers: Comparable products manufactured by Versico, or approved equal.
   c. Fire Rating: UL Class "A" fire retardant.
   d. Wind Rating: 72 mph, minimum.
   e. Membrane:
      1. General: .080 thick scrim reinforced thermoplastic polyolefin (TPO) sheet.
      2. Perimeter Membrane: 4'-0" as recommended by manufacturer.
      3. Field Membrane: 8'-0" as recommended by manufacturer.
      4. Color: White.
      5. Flashing:
         a) General: Reinforced.
         b) Vent, Pipe, Drain and Corner Flashing: As recommended by manufacturer; color to match general membrane.
      6. Walkway Pads: Manufacturer's standard.
      7. Primer, Adhesive and Sealant: Manufacturer's standard low VOC.
   f. Fasteners: Galvanized or non-corrosive type as recommended by manufacturer for application shown.
3. Accessories: Manufacturer's standard, as shown.
4. Underlayment:
   a. General: ½ inch Dens Deck DuraGuard Roof Board manufactured by Georgia-Pacific Corp.

b. Alternate Manufacturers: Comparable products manufactured by the United States Gypsum Co., or approved equal.
c. Adhesive: As recommended by manufacturer.
d. Fasteners: Appropriate for use intended and approved for fire rating required.
5. Cant Strips: FS LL-I-535, 2 inch x 2 inch fiberboard, unless shown otherwise.
6. Sealant: As recommended by roof membrane manufacturer.

3. EXECUTION:

A. PREPARATION:
1. Environmental Requirements: Do not apply wet roofing, on wet application surface, or when temperature of deck is less than 50 degrees F.
2. Examination: Examine conditions of work in place before beginning work; report defects.
3. Coordination: Provide entire roof system including treated wood nailers and coordination of items such as roof drains, sumps, jacks, etc., as specified in Section 07 60 00 - FLASHING AND SHEET METAL.
4. Protection:
a. General: Protect adjoining materials from stains particularly around perimeter of building; prevent debris from clogging roof drains.
b. Temporary Waterproofing: Provide temporary protective sheeting over uncovered deck surfaces. Turn sheeting up and over parapets and curbing; retain in position with weights or temporary fasteners, as required. Provide for surface drainage from sheeting to existing roof drains. Roofing contractor is fully liable for water entry and resulting damage to the building, its contents, or roofing work.
5. Surface Preparation:
a. General: Deck surface swept clean and dry; keep free of loose and foreign materials.
b. Existing Deck: Remove existing roofing material as shown. Repair existing deck surface to provide smooth working surface for new roofing. Provide dry deck surface, free of rough spots, ridges, projections, pockets or depressions.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Rigid Insulation: Refer to section 07 21 00 - THERMAL INSULATION.
3. Underlayment: As required for fire rating.
4. Cant Strips: Install in angle of intersections of roof deck and vertical walls and curbs, as shown. Miter corners evenly.
5. Metal Flashings:
a. General: Fabricate and install per Section 07 60 00 - FLASHING AND SHEET METAL, as shown and per manufacturer's recommendations.
b. Base Flashing: Extend up vertical surfaces 6 inches, minimum, and onto the horizontal roof surfaces not less than 5-1/2 inches, unless otherwise shown.
c. Roof Jack at Plumbing Vents, Drains and Accessories: Install as shown, per manufacturer's instructions.
6. Application:
a. General: Unroll over prepared substrate; mechanically fasten at perimeter, corners and field. Lap adjoining sheets 5-1/2 inches and splices 1-1/2 inches, minimum. Cover mechanically fastened discs and top edges of roofing sheet seams.
b. Parapet Wall Covering: Install as shown, extend to full height of parapet; lap under parapet cap flashing and extend down outside wall 2 inches, minimum. Secure in place to assure a completely watertight installation.
c. Walkway: Per manufacturer's instructions and as shown.
7. Fasteners: Per manufacturer's recommendation; fastening length and pattern based on performance values supplied by the fastener manufacturer and conforming to Factory Mutual fastening pattern.

C. FIELD QUALITY CONTROL:
1. General: Apply roofing materials when manufacturer's representative, City Representative and City Resident Engineer are present.
2. Flood Testing: Flood test roof per City of San Diego Facilities Division Standards.

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FLASHING AND SHEET METAL Section 07 60 00

1. GENERAL:

A. SUMMARY: Provide Flashing and Sheet Metal, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. National Association of Architectural Metal Manufacturers (NAAMM): Metal Finishes Manual for Architectural and Metal Products.
   3. National Roofing Contractors Association (NRCA):
      a. General: NRCA Roofing and Waterproofing Manual.
      b. Sheet Metal: NRCA Architectural Sheet Metal and Metal Roofing Manual.
   4. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual.
   5. Specialty Steel Industry of North America (SSINA): Finishes for Stainless Steel.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit guarantee in required form for a period of two (2) years from date of final acceptance by Owner.
D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Sheet Material:
      a. Galvanized Sheet Metal:
         1. General: ASTM A653; 24 gage minimum, core steel.
         2. TPO Coated: Coat all sheet metal in contact with PVC roofing membrane as specified in Section 07 54 00 - THERMOPLASTIC MEMBRANE ROOFING.
      b. Stainless Steel: ASTM A167 and ASTM A666, type 304, with SSINA No. 4 finish, 18 gage; size and shape as shown.
   2. Underlayment:
      a. General: ASTM D2626, 15 lb. asphalt saturated roofing felt, unperforated.
      b. Self Sealing Underlayment:
         1. General: Rain-Proof High Performance Roof Underlayment manufactured by Protecto Wrap Co.
         2. Alternate Manufacturers: Comparable products manufactured by Grace Construction Products, or approved equal.
         3. Primer: As recommended by manufacturer.
   3. Fasteners:
      a. General: Same metal as sheet metal flashing or other non-corrosive metal as recommended by sheet metal manufacturer, designed to withstand design loads. Match finish of exposed heads with material being fastened.
      b. Nails:
         1. General: FS FF-N-105; same material and finish as flashing metal.
         2. Steel: Hot-dipped galvanized, annular thread, size as required.
         3. Concrete: Flat head, size as required.
      c. Screws: Stainless steel self tapping type, size as required.
      d. Rivets: 1/8 inch diameter, solid type; rust resistive.
      e. Washers: Neoprene, where required.
   4. Solder:
      a. General: ASTM B32; 50/50 type; lead free.
      b. Flux: FS O-F-506.
      c. Stainless Steel: ASTM B32, Grade Sn60; use with acid flux type as recommended by stainless-steel sheet manufacturer; use a noncorrosive rosin flux for tinned surfaces.
   5. Finishes:
      a. Galvanizing Repair Treatment:
         1. Rod: Per ASTM A780.
         2. Coating: Per MIL-P-46105.
      b. Protective Coatings:
         1. General: FS TT-C-494, Type II; bituminous.
         2. Backing Paint: Zinc chromate, alkyd.
   6. Plastic Cement: ASTM D2822, asphalt type.

7. Sealing Tape: Refer to Section 07 92 10 - JOINT SEALERS.
8. Sealants: FS TT-S-230, non-hardening, non-sagging; refer to Section 07 92 10 - JOINT SEALERS.

B. FABRICATION:
1. Manufacture:
   a. General: Fabricate and assemble sheet metal work in shop; field fabricate only when required by restrictive field conditions. Form sections, per referenced standards, true to shape, accurate in size, square, and free from distortion or defects. Form pieces in single length sheets, not to exceed 10'-0" in length. Hem exposed edges on underside 1/2 inch; miter and seam corners.
   b. Seams: Flat lock.
   c. Corners: One piece with minimum 18 inch long legs; solder for rigidity, seal with sealant.
   d. Cleats: Minimum 2 inches wide, interlockable with sheet.
   e. Vertical Faces: Bottom edge formed outward 1/4 inch and hemmed to form drip.
   f. Flashing Toe: Extend toe 2 inches over roofing; return and brake edges.
   g. Soldering: Solder shop-formed metal joints. After soldering, remove flux; wipe and wash solder joints clean. Weather seal joints.
   h. Back Painting: Paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.
2. Assemblies:
   a. General: Fabricate with galvanized sheet metal, unless otherwise shown.
   b. Flashing:
      1. General: Fabricate as shown.
      2. Parapet Caps and Closures: Provide parapet caps, other caps and closures as required; 20 gage; size as shown.
      3. Exterior Hollow Metal Frame Flashing: 18 gage, as shown.
   c. Countertops:
      1. Galvanized Steel Workbench: One piece construction, front to back; 14 gage, size as shown.
      2. Stainless Steel Countertops:
         (a) General: ASTM A167 and ASTM A666, type 304, 14 gage monolithic counters and backsplashes, all welded construction ground smooth to a uniform finish; size as shown.
         (b) Stainless Steel Decontamination Sink/Counter: ASTM A167 and ASTM A666, type 304, 14 gage 1-piece, with dual sinks with knife edge at center; as shown.

3. EXECUTION:

A. PREPARATION:
1. Examination: Examine conditions of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.
3. Storage: Stack preformed material to prevent twisting, bending or abrasion; slope to ensure drainage.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Underlayment:
   a. General: Apply one (1) layer of felt underlayment over surfaces as shown; lap all edges 6 inches minimum, in direction of slope.
   b. Self Sealing Underlayment:
      1. General: Apply under flashings at horizontal surfaces and surfaces up to 30 degrees from horizontal. Clean and prepare surfaces as recommended by manufacturer.
      2. Application: Install as shown, per manufacturers instructions. Roll surface to remove wrinkles and assure adhesion.
3. Application:
   a. General: Make corners square, surfaces true and straight in planes, and lines accurate to profiles. Fit sheet metal tight in place; secure using concealed fasteners. Apply plastic cement compound between metal flashings and felt flashings. Seal metal joints watertight.
   b. Expansion and Contraction: Allow for expansion and contraction over an ambient temperature range up to 150 degrees F; distortions resulting from fastening or expansion and contraction stresses not acceptable.
   c. Dissimilar Metals: Isolate with heavy coat of bituminous paint. Coat all sheet metal in contact with roofing felts.

4. Assemblies:
   a. Flashing:
      1. General: Install flashings where shown; miter and solder joints at corners. Lap joints in counterflashing at least 6 inches and make watertight with sealing tape. Extend counterflashing down not less than 6 inches.
      2. Parapet Caps and Closures: Install miscellaneous caps and closures as required and as shown. At parapet caps provide 1/2 inch per foot slope to the inside of building; install blocking as required.
      3. Exterior Hollow Metal Frame Flashing: Provide at frame heads, as shown.
   b. Countertops: Install over plywood backing as shown; secure metal to wood with screws on underside of counter. Lay countertops tightly, without waves or buckles.
5. Sealants: As shown; set pan and base flashings in full bed of sealant.
6. Galvanizing Repair Treatment: Repair damaged zinc coating with specified repair compound, as required.

C. FIELD QUALITY CONTROL: Leaking, failure to stay in place, undue expansion, lifting deformation, loosening, buckling, tearing and splitting of seams will be considered defective work; make necessary corrections.

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SELF-ADHERED SHEET FLASHING Section 07 65 26

1. GENERAL:

A. SUMMARY: Provide Self-Adhered Sheet Flashing, as shown and specified per Contract Documents.

B. REFERENCES:

1. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   b. ASTM C920: Standard Specification for Elastomeric Joint Sealants.
   c. ASTM C1193: Standard Guide for Use of Joint Sealants.
   d. ASTM D882: Test Method for Tensile Properties of Thin Plastic Sheeting.
   e. ASTM E84: Test Method for Surface Burning Characteristics of Building Materials.
   f. ASTM E96: Test Method for Water Vapor Transmission of Materials.
   g. ASTM E1677: Specification for Air Retarder Material or System for Framed Building Walls
   h. ASTM E2178: Test Method for Air Permeance of Building Materials.
   i. ASTM E2357: Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
2. American Association of Textile Chemists and Colorists (AATCC): Test Method 127 Water Resistance - Hydrostatic Pressure Test.
3. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.

C. SUBMITTALS:

1. General: Submit product data.
2. Closeout: Submit guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

D. QUALITY ASSURANCE:

1. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:

1. LEED Certification Requirements:
   a. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory and the following:
2. Self-Adhered Sheet Flashing:
   a. General: Products manufactured by DuPont Tyvek Weatherization Systems.
   b. Alternate Manufacturers: Comparable products manufactured by Raven Engineered Films, or approved equal.
   c. Weather Barrier Membrane: DuPont Tyvek CommercialWrap.
   d. Seam Tape: DuPont Tyvek Flashing Tape.
   e. Flashing: DuPont FlexWrap NF and StraightFlash, where shown.
3. Fasteners: As recommended by manufacturer.
4. Sealant: As recommended by manufacturer..

3. EXECUTION:

A. PREPARATION:

1. Scheduling: Review requirements for sequencing of application with installation of windows, doors, louvers and flashings to provide a weather-tight assembly.
2. Environmental Requirements: Do not install during inclement conditions.
3. Examination: Examine conditions of work in place before beginning work; report defects.
4. Measurements: Take field measurements; report variance between plan and field dimensions.

B. INSTALLATION:

1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Application: Install at exterior door and window openings as shown.

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FIRESTOPPING Section 07 84 00

1. GENERAL:

A. SUMMARY: Provide Firestopping, as shown and specified per Contract Documents.
B. REFERENCES:
1. American Society for Testing and Materials (ASTM):
a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
b. ASTM E84: Test Method for Surface Burning Characteristics of Building Materials.
c. ASTM E119: Method for Fire Tests of Building Construction and Materials.
d. ASTM E814: Test Method of Fire Tests of Through-Penetration Firestops.
2. International Firestop Council (IFC): Guidelines for Evaluating Firestop Systems Engineering Judgements.
3. Underwriters Laboratories, Inc. (UL):
a. Fire Resistance Directory:
1. BXUV: Fire Resistance Ratings.
2. XHCR: Through-penetration Firestop Devices.
3. XHEZ: Through-penetration Firestop Devices.
4. XHHW: Fill, Void and Cavity Material.
5. XHKU: Forming Materials.
b. UL-1479: Fire Tests of Through-Penetration Firestops.
c. UL-2079: Tests for Resistance of Building Joint Systems.
C. SUBMITTALS:
1. General: Submit product data.
2. Shop Drawings: Submit manufacture and installation details, including proposed material, approved systems, reinforcement, anchorage, fastenings, and procedures for installation reflecting actual conditions, for review.
3. Certificates: Manufacturer shall certify that products meet or exceed specified requirements for fire rating for assemblies penetrated.
4. Closeout: Submit guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE:
1. Single Source Responsibility: Provide a complete UL listed firestop system of a single manufacturer only. Combinations of multiple manufacturers' products not allowed.
2. Installer: Specializing in the work of this Section with minimum two (2) years documented experience; manufacturer approved. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
1. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS- 36.
2. Firestopping:
a. General: Manufactured by Hilti, Inc..
b. Alternate Manufacturers: Comparable products manufactured by 3M Fire Protection Products, or approved equal.
3. Cast-in place: CP 680 Cast-In Firestop Devices; type as recommended by manufacturer.
4. Intumescent Fire Blocks:
a. General: CP 657 Fire Block,, size as required.
b. Collars: CP 643 or CP 644 Firestop Collar.
c. Metal Deck: CP 777 Speed Plugs.
5. Mortar: CP 637 Firestop Mortar.
6. Foam: CP 620 Fire Foam.
7. Primer: As recommended by manufacturer.
8. Sealants:
a. Intumescent: FS-ONE Intumescent Firestop Sealant.
b. Self Leveling: CP 604 Self Leveling Firestop Sealant.
c. Elastomeric: CP 601s Elastomeric Firestop Sealant.
d. Flexible: CP 606 Flexible Firestop Sealant.
9. Putty: CP 618 Putty Stick.
10. Spray: CP 672 Firestop Spray.

11. Fasteners:
    a. Retainers: Manufacturer's standard clips to support mineral fiber matting.
    b. Masking Tape: Pressure sensitive adhesive tape recommended by manufacturer.
12. Accessories: As recommended by the manufacturer for the condition and fire rating shown.
13. Dam Material:
    a. General: Permanent or removable as recommended by sealant manufacturer.
    b. Safing Insulation: Mineral fiber; unfaced; thickness as shown.
    c. Mineral Fiberboard: Mineral fiber fireproofing, unfaced; thickness as shown.
    d. Intumescent Coated Mineral Wool Strips: CP 648 Wrap Strips; type as recommended by sealant manufacturer.

3. EXECUTION:

A. PREPARATION:
1. Scheduling: Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.
2. Environmental Requirements: Do not apply materials when temperature is below 60 degrees F; maintain minimum temperature before, during, and for three (3) days after installation.
3. Examination: Examine conditions of work in place before beginning work; report defects.
4. Surface Preparation: Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Fire Ratings: As shown.
3. Dam Materials: Install as backing to arrest liquid material leakage; remove after firestopping material has cured.
4. Primer: Where required; per manufacturer's instructions.
5. Firestopping: Install material at floors, walls, partitions, ceilings and other openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping to thickness needed for the fire rating required.

* * *

JOINT SEALERS Section 07 92 10

1. GENERAL:

A. SUMMARY: Provide Joint Sealers, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM):
      a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
      b. ASTM C1472: Standard Guide for Calculating Movement and Other Effects When Establishing Sealant Joint Width.
   2. Sealant, Waterproofing and Restoration Institute (SWRI): Sealants: The Professional's Guide.
C. SUBMITTALS:
   1. General: Submit product data, samples, and certification that sealants proposed for use comply with the Contract Documents.
   2. Certifications: Submit SWRI Liquid Sealant Validation for all liquid products.
   3. Closeout: Submit maintenance data and guarantee in required form for a period of ten (10) years from date of final acceptance by Owner.
D. QUALITY ASSURANCE:
   1. Qualifications:
      a. General: The manufacturer of the sealant used shall have been in the business of manufacturing the specified types of such sealants for not less than 10 years.
      b. Applicator: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
      c. Volatile Organic Compounds (VOC): Use only products in compliance with VOC content limits required by Federal and State EPA regulations.
   2. Compatibility with Substrate: Verify that calking and sealants used are compatible with joint materials.
   3. Joint Tolerances: Comply with manufacturer's joint width/depth ratio limitations.

2. PRODUCTS:

A. MATERIALS:
   1. LEED Certification Requirements:
      a. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS-36.
   2. Joint Sealers:
      a. General: Manufactured by Tremco, Inc.
      b. Alternate Manufacturers: Comparable products manufactured by the Pecora Chemical Corp., or approved equal.
      c. Color:
         1. Concealed Joints: Manufacturer's standard color as selected by the City Representative having best overall performance characteristics for indicated application.
         2. Exposed Joints: Custom color selected by City Representative.
   3. Exterior Joints:
      a. Vertical Surfaces: Non-sag polyurethane; Dymonic.
      b. Butyl Preformed Sealing Tape: Tremco 440 Tape.
      c. Horizontal Paving Joints: Self-leveling polyurethane, THC 900; interior and exterior.
   4. Interior Joints:
      a. General: Acrylic Latex, TremGlaze SA1100.
      b. Ceramic Tile and Plumbing Fixture Joints: Silicone rubber; Proglaze.
      c. Sound Transmission: Tremco Acoustical Sealant.
      d. Firestop Caulking: Refer to Section 07 84 00 - FIRESTOPPING.
   5. Joint Cleaner: Provide cleaner recommended by sealant manufacturer for specific joint surface and condition.
   6. Joint Primer and Sealer: Non-corrosive and non-staining type as recommended by sealant manufacturer for each condition.
   7. Joint Backing: Round, open cell non-gassing polyurethane foam rod or closed cell polyethylene foam as recommended by the manufacturer, oversized 30 percent larger than joint width.
   8. Bond Breaker: Pressure sensitive tape as recommended by sealant manufacturer to suit application.
   9. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces

adjacent to joints.

10. Other Materials: Manufacturer's standard for items required or type best suited for proper execution of the work.

3. EXECUTION:

A. PREPARATION:

1. Environmental Requirements: Do not apply materials when temperature is below 40 degrees F, or under extreme temperature conditions when joint width is expanded or contracted beyond normal conditions.
2. Examination:
   a. General: Carefully examine before beginning work; report defects.
   b. Substrate: Inspect surfaces to ensure that no previously installed bond-breaker materials contaminate the surface to which the sealant is to adhere. Require repair of unsound substrates. Commencement of work constitutes acceptance of substrate.
3. Storage: Per manufacturer's recommendations for proper precautions for shelf life, temperature, humidity and similar storage factors to ensure the fitness of the material when installed.
4. Surface Preparation:
   a. General: Prepare joints in accordance with manufacturer's instructions to ensure maximum adhesion. Remove loose materials and foreign matter that might impair adhesion of sealant.
   b. Masking: Tape as required to prevent contact of sealant with adjoining surfaces to prevent permanent staining, damage by contact, or by cleaning methods required to remove sealant smears.
   c. Sealants: Prepare as required, including proper mixing of multi-component sealants.
5. Protection: Protect surfaces adjacent to joints to receive sealant. Cover joints in walking surfaces with heavy duty, non-staining tape, until material has dried.

B. APPLICATION:

1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Joints: Review joint size and movement per ASTM C1472.
3. Installation:
   a. General: Install per manufacturer's instructions, within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within recommended ranges.
   b. Joint Cleaner: Apply per manufacturer's instructions.
   c. Primer: Apply as required; protect adjacent exposed surfaces.
   d. Backing: Install to achieve a neck dimension no greater than 1/3 of the joint width, unless otherwise shown. Use blunt or rounded tools to ensure uniform (+ or - 1/8 inch) depth without puncturing material. Use oversize backer rod; minimum of 33% for closed cell type; minimum of 50 percent for open cell type, unless otherwise required by the manufacturer.
   e. Bond Breaker: Install where joint backing is not used.
   f. Sealant: Install free of air pockets, foreign embedded matter, ridges, and sags; prevent three sided adhesion. Measure joint dimensions and size materials to achieve required 2:1 width/depth ratios, unless otherwise noted. Provide sealant depth of one half (1/2) joint width; minimum depth of 1/4 inch; maximum of 1/2 inch, unless otherwise required by the manufacturer.
   g. Sound Transmission: Install sealant per manufacturer's instructions to obtain STC Values shown.
   h. Firestopping: Apply as required to comply with fire ratings shown.
   i. Masking: Remove tape immediately after tooling without disturbing joint seal.

* End Division 07 *

Division 08 - OPENINGS

STEEL DOORS AND FRAMES Section 08 11 10

1. GENERAL:

A. SUMMARY: Provide Steel Doors and Frames, as shown and specified per Contract Documents.
B. REFERENCES:
1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
2. American National Standards Institute (ANSI):
a. ANSI A117.1: Accessible and Usable Buildings and Facilities.
b. ANSI A250.8: Recommended Specifications for Standard Steel Doors and Frames.
3. Americans with Disabilities Act (ADA):
a. General: Americans with Disabilities Act of 1990, ADA - 42 U.S. Code Chapter 126.
b. ADA Standards for Accessible Design: U.S. Department of Justice, 28 CFR Part 36.
4. Door Hardware Institute (DHI): Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
5. Intertek Testing Services (ITS): Certification listings for fire doors.
6. Steel Door Institute (SDI):
a. ANSI/SDI-250.6: Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
b. ANSI/SDI-250.8: Recommended Specification for Standard Steel Doors and Frames
c. ANSI/SDI-250.11: Recommended Erection Instructions for Steel Frames.
7. Underwriters Laboratories, Inc. (UL): UL 10C - Positive Pressure Fire Tests of Door Assemblies.
C. SUBMITTALS:
1. General: Submit product data, and samples.
2. Shop Drawings: Show details of each condition shown at 3 inch scale.
3. Test Reports: Refer to Section 01 45 23 - TESTING AND INSPECTION SERVICES.
4. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE:
1. Labeled Doors and Frames: Conform to requirements of State Fire Marshal and Underwriters Laboratory.
2. Design Requirements: Exterior glazed frame members designed to withstand a wind load of 24 lbs. per square foot, minimum.
3. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
1. Steel:
a. Sheet: ASTM A1008 and ASTM A1011, uncoated, pickled, and free from pits and defects. Use cold-rolled or hot-rolled for frames; stretcher-leveled for 18 gage and lighter.
b. Galvanized Steel Sheets: Zinc-coated carbon steel complying with ASTM A653, commercial quality.
c. Reinforcement: ASTM A36.
2. Fasteners:
a. General: Galvanized or cadmium plated.
b. Bolts and Nuts: ASTM A307, Grade A.
c. Machine Screws: FS FF-S-92, Type III cross-recessed, Design I or II recess, Style 2c flat head; carbon steel.
3. Sound Deadening: Fibered asphalt emulsion.
4. Silencers: Resilient rubber; manufacturer's standard.
5. Sealant: Refer to Section 07 92 10 - JOINT SEALERS.
6. Primer: Refer to Section 09 91 00 - PAINTING.
B. MANUFACTURE:
1. General: Specified products are manufactured by Ceco Door Products, unless otherwise noted.
2. Alternate Manufacturers: Comparable products manufactured by the Kewanee Corp., or approved equal.

3. Hardware Requirements: Prepare doors and frames at factory to receive template hardware per final schedule; locate as specified under Section 08 71 00 - DOOR HARDWARE. Provide reinforcements of specified thicknesses and sizes recommended by hardware manufacturer; hinge reinforcements not less than 7 gage and at least 9 inches long; mortised and countersunk items not less than 12 gage; surface applied items not less than 14 gage; other reinforcing per ANSI A250.6.
4. Metal Doors:
   a. General:
      1. Exterior (Non-thermally Broken): SDI-100 Level II, Model 1; galvanized.
      2. Exterior (Thermally Broken): SDI-100 Level II, Model 2; galvanized.
      3. Interior (Non-rated): SDI-100 Level II, Model 1.
      4. Interior (Fire Rated): SDI-100 Level II, Model 2.
   b. Door Construction:
      1. Face: Steel sheet in accordance with ANSI A250.8.
      2. Core:
         a) Unrated: Manufacturer's standard.
         b) Composite: For fire rating, as shown.
         c) Thermal Insulated: Total insulation R value of 11, measured in accordance with ASTM C1363 under ASTM C1199.
         d) Sound Rated: STC of 50, measured in accordance with ASTM E413.
   c. Louvers:
      1. General: Model No. 900 manufactured by Air Louvers, Inc.
      2. Alternate Manufacturers: Comparable products manufactured by Anemostat Door Products, a Mestek Company, or approved equal.
      3. Fasteners: Manufacturer's standard; tamperproof.
5. Metal Frames:
   a. Exterior: 14 gage; galvanized.
   b. Interior Frames: 16 gage.
   c. Sound Deadening: Apply thick coat to inside of frames.
6. Finish: Baked primer.

C. FABRICATION:
1. Metal Doors:
   a. General: Fabricate to sizes and shapes shown.
   b. Flush Doors: Fabricate honnycomb core doors with hardware reinforcement welded in place. Full seam welded with sealed top; seal joints watertight.
   c. Fire Rated Doors: Permanently attach fire rating label to each door unit.
   d. Door Louvers: As shown.
   e. Door Clearances: Provide 1/8 inch maximum clearance at jambs, heads, and meeting stiles; threshold clearances as specified under Section 08 71 00 - DOOR HARDWARE.
   f. Electrical Requirements: Make provisions for installation of electrical items specified under Section 08 71 00 - DOOR HARDWARE and other applicable Sections.
2. Metal Frames:
   a. Standard Frames: Fabricate frames as welded unit.
   b. Fire Rated Frames: Fabricate as specified for standard metal frames; permanently attach fire rating label to frame.
   c. Reinforcement:
      1. General: Reinforce frames wider than 48 inches with roll-formed steel channels fitted tightly into frame head, flush with top.
      2. Hardware: Fabricate frames with reinforcing plates welded in place. Provide mortar guard boxes, where required.
   d. Stops:
3. Anchors:
   a. General: Fabricate 16 gage x 2 inch wide anchors of same material used for door frames.
   b. Wood Stud Partitions: Wood stud anchors with perforations.

3. EXECUTION:

A. PREPARATION:
1. Examination: Examine conditions of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.
3. Protection: Protect metal surfaces after installation; any indication of deterioration, use or damage will be unacceptable.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Fire Rated Openings: As shown; make manufacturer's installation instructions available to inspecting authorities.

3. Anchors:
   a. Jambs:
      1. General: Position one (1) anchor above top butt reinforcement and one (1) anchor below bottom butt reinforcement; minimum four (4) anchors per door jamb, 24 inches on center maximum.
      2. Frames Set in Wood Stud Partitions: Weld anchors to frames; secure to wood studs with two (2) fasteners per anchor. Use two (2) No. 12 x 2-1/2 inch flathead screws, or two (2) 12d nails **(wire anchors not acceptable)**.
   b. Head: Provide minimum of two (2) anchors at frames over 2'-6" wide; 24 inches on center, maximum.
4. Metal Frames:
   a. General: Set frames plumb, straight and square; align and securely brace until permanent anchors are set; use shims where required. Remove temporary braces after wall construction is completed.
   b. Door Frames: Where shown, provide overhead frame bracing; securely anchor to structure. Install roll-formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.
   c. Sealant: Seal perimeter of frames and adjoining material per Section 07 92 10 - JOINT SEALERS.
5. Metal Doors:
   a. General: Match doors into their respective frames; install plumb, straight and square.
   b. Louvered Doors: As shown.
   c. Hardware: Refer to Section 08 71 00 - DOOR HARDWARE.
   d. Maximum Diagonal Distortion: 1/8 inch measured with straight-edge, corner to corner.
6. Finish: Touch-up factory applied baked primer; refer to Section 09 91 00 - PAINTING.

C. ADJUSTMENT: Prior to acceptance, adjust moveable parts to assure smooth operation.

* * *

FLUSH WOOD DOORS Section 08 14 16

1 GENERAL:

A. SUMMARY: Provide Flush Wood Doors, as shown and specified per Contract Documents.
B. REFERENCES:
   1. Intertek Testing Services (ITS): Certification listings for fire doors.
   2. Window and Door Manufacturers Association (WDMA): WDMA I.S. 1A: Architectural Wood Flush Doors.
   3. Underwriters Laboratories, Inc. (UL): UL 10C - Fire Tests of Door Assemblies.
   4. Woodwork Institute (WI): Architectural Woodwork Standards (AWS); Section 9 - Doors.
C. SUBMITTALS:
   1. General: Submit product data and samples.
   2. Certificates:
      a. General: Submit WI Certified Compliance Certificate for Installation.
      b. Hardwood:
         1. General: Submit certification and documentation verifying that hardwood lumber and veneers were obtained from sustainably managed sources and that certified lumber was properly segregated from other materials while in storage and production.
         2. Acceptable Certifying Agencies:
            a) Rainforest Alliance (RA): "Smart Wood Program".
            b) Scientific Certification Systems (SCS): Forest Stewardship Council (FSC) "Forest Conservation Program".
   3. Closeout: Submit maintenance data and guarantee in required form for a period of two (2) years from date of final acceptance by Owner.
D. QUALITY ASSURANCE:
   1. Labeled Doors: Conform to requirements of State Fire Marshal Standard 12-7-4 and Underwriters Laboratory for labeled wood doors in fire-rated openings.
   2. Testing: One (1) or more doors, of each type, may be selected at random from those delivered for testing. Those tested or cut apart will be used to determine compliance with specified requirements; noncompliance is basis for rejection of all of that kind and type of door delivered to the site. Acceptable doors used for testing will be replaced at Owner's expense.

2 PRODUCTS:

A. MATERIALS:
   1. LEED Certification Requirements:
      a. Certified Wood Products: Use only Forest Stewardship Council (FSC) certified wood products from acceptable FSC sources with Chain of Custody (CoC) documentation and number.
      b. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS-36.
   2. Flush Wood Doors:
      a. General: Conform to Premium Grade standards, per AWS Section 9 - Doors.
      b. Manufacture:
         1. General: Signature Series - Environmental Class Doors manufactured by Marshfield Door Systems, Inc.
         2. Alternate Manufacturers: Comparable products manufactured by Algoma Hardwoods, Inc., or approved equal.
      c. Flush Type:
         1. Interior: 1-3/4 inch thick.
            a) Construction:
               1) Solid Core:
                  a) Unrated and 20 Minute: FSC staved.
                  b) Fire Rated: Mineral core; 45 and 60 minute.
                  c) Acoustical: Signature Series Sound Retardant Doors; STC rating as shown.
               2) Edge-bands: WDMA hardwood.
            b) Facing: Birch.
            c) Adhesive: PS 51 Type I and II.
      d. Accessories:
         1. General: Manufactured by the Air Louvers, Inc.
         2. Alternate Manufacturers: Comparable products manufactured by Anemostat Door Products, a Mestek Company, or approved equal.

3. Louvers: Model No. 900; fire rated as shown.
4. Vision Light Frames: Model No. VLF; glass and glazing per Section 08 81 00 - GLASS GLAZING, as shown.
5. Fasteners: Manufacturer's standard; tamperproof.

e. Finish: Manufacturer's standard WDMA I.S.1A finish; color as selected by City Representative. Provide additional coat of finish on face of interior doors.

3. Hardware Requirements: Prepare doors at factory to receive template hardware per final schedule; locate as specified under Section 08 71 00 - DOOR HARDWARE. Provide reinforcements of specified thicknesses and sizes recommended by hardware manufacturer and per ANSI A250.6.

3 EXECUTION:

A. PREPARATION:
1. Examination: Examine conditions of work in place before beginning work; report defects. Verify that door frames are the type required for door and are properly installed. Install fire rated doors only in corresponding fire rated frames.
2. Measurements: Take field measurements; report variance between plan and field dimensions.
3. Delivery:
   a. General: Pack and protect doors against damage during shipment and storage. Do not use packing materials that will stain or discolor door surface.
   b. Storage: Per WI Technical Bulletin No. 420-R for flush doors and No. 416-R for fire rated doors. Store materials under cover, in heated rooms and protected from damage, including exposure to excess humidity.

B. INSTALLATION:
1. General: Install in strict conformance with CBC, other referenced standards, the manufacturer's written directions, as shown, and as herein specified. Make manufacturer's instructions available to the inspecting authorities.
2. Door Types: Install where shown.
3. Tolerances:
   a. General: Maximum distortion measured with straight edge or taut string, corner to corner, over an imaginary 36 inch x 84 inch surface area.
   b. Diagonal (Warp), Vertical (Bow) and Width (Cup): 1/8 inch.
4. Hardware: Per Section 08 71 00 - DOOR HARDWARE. Fit doors to specified clearances; do not trim job fitted doors more than 1/4 inch from any edge.
5. Glazing: Per Section 08 81 00 - GLASS GLAZING.

C. ADJUSTMENT: Prior to acceptance, adjust moveable parts to assure smooth operation.

* * *

ACCESS DOORS AND PANELS Section 08 31 00

1. GENERAL:

A. SUMMARY: Provide Access Doors and Panels, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. Access Panels:
      a. General: Steel frame with continuous hinge, manufactured by Milcor Inc.; sizes as shown.
      b. Alternate Manufacturers: Comparable products manufactured by Samson Products Inc., or approved equal.
      c. Wall and Ceiling: Gypsum wallboard; Style M, with standard cam lock.
      d. Fire Rated Openings:
         1. General: Style UFR with flush face key operated mortise cylinder lock and interior latch release mechanism; UL rating of 1-1/2 hours; "B" label.
         2. Sizes: Custom and as shown.
   2. Fasteners: As recommended by manufacturer.
   3. Primer: Rust inhibiting as recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Access Panels: Locate access doors as required for access to and operation of mechanical and electrical devices; refer to Division 22 - PLUMBING, Division 23 - HEATING, VENTILATING AND AIR CONDITIONING, and Division 26 - ELECTRICAL.

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SLIDING GLASS DOORS Section 08 32 00

1. GENERAL:

A. SUMMARY: Provide Sliding Glass Doors, as shown and specified per Contract Documents.

B. REFERENCES:

1. Aluminum Association (AA): Standards.
2. Aluminum Anodizers Council (AAC): Standards.
3. American Architectural Manufacturers Association (AAMA): AAMA 101 - Aluminum Prime Windows and Sliding Glass Doors.
4. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   b. ASTM E330: Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
   c. ASTM E283: Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
   d. ASTM E2268: Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
5. Glass Association of North America (GANA): Glazing Manual.
6. National Fenestration Rating Association (NFRA): NFRC 100 - Procedure for Determining Fenestration Product Thermal Properties (Currently Limited to U-Value).
7. Window and Door Manufacturers Association (WDMA): WDMA IS-2 - Industry Standard for Wood Windows.

C. SUBMITTALS:

1. General: Submit product data, shop drawings and samples.
2. Closeout: Submit maintenance data, and guarantee in required form for a period of FIVE (5) years from date of final acceptance by Owner.

D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:

1. Vinyl Sliding Glass Doors:
   a. General: Style Line Vinyl Patio Doorsmanufactured by Milgard Windows; type and size as shown.
   b. Alternate Manufacturers: Comparable products manufactured by Jeld-Wen, Inc., or approved equal.
   c. Pull Handles: Manufacturer's standard; type as selected by the City Representative.
   d. Finishes: Manufacturer's standard; color as selected by the City Representative.
2. Glass and Glazing Materials: Specified in Section 08 81 00 - GLASS GLAZING.
3. Screen:
   a. Frame: Manufacturer's standard; size of operable glazed unit.
   b. Mesh: FS RR-W-365, woven aluminum, 14/18 mesh size; black color finish.
4. Hardware:
   a. Threshold: Manufacturer's standard; thermally broken, sloped to exterior.
   b. Sliding Panel Bottom Rollers: Manufacturer's standard; adjustable from interior.
   c. Limit Stops: Resilient rubber.
5. Weatherstripping: Manufacturer's standard.
6. Anchors: Corrosion resistant steel.
7. Bituminous Paint: Fibered asphaltic type.
8. Glass and Glazing: As shown; refer to Section 08 81 00 - GLASS GLAZING.
9. Sealant and Backing Materials: As specified in Section 07 92 10 - JOINT SEALERS.

B. FABRICATION:Size and fabricate door assembly to allow for tolerances of rough framed openings, clearances, shim spacing and shims around perimeter of assemblies. Ensure joints and connections are flush, hairline, and waterproof. Install glass in fixed and sliding units.

3. EXECUTION:

A. PREPARATION:

1. Examination: Examine conditions of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.
3. Protection: Cover finished surfaces with protective wrapping. Do not use adhesive papers or sprayed coatings which bond to substrate when exposed to sunlight or weather.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Attachment: Anchor frame and shims to perimeter opening to accommodate construction tolerances and other irregularities. Use manufacturer recommended devices to securely fasten sliding door assembly to wall construction without distortion or imposed stresses.
3. Electrolytic Protection: Coat dissimilar metals with application of bituminous paint.
4. Sealants: Install perimeter sealant in accordance with Section 07 92 10 - JOINT SEALERS.

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HIGH SPEED ROLLING DOORS Section 08 36 27

1. GENERAL:

A. SUMMARY: Provide High Speed Rolling Doors, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. National Electrical Manufacturers Association (NEMA):
      a. NEMA 250: Enclosures for Electrical Equipment (1000 Volts Maximum).
      b. NEMA ICS 2: Standards for Industrial Control Devices, Controllers and Assemblies.
      c. NEMA MG1: Motors and Generators.
   3. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Certificates: UL Certificate of Inspection for fire rated doors exceeding UL listed sizes.
   3. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience; manufacturer approved. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. High Speed Rolling Door:
      a. General: High Speed Rolling Service Doors manufactured by the Rytec Corp., or approved equal; size as shown.
      b. Recycled Metal Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost) of the total value of the materials for the project.
      c. Door Type 1:
         1. General: Spiral Standard with manufacturers standard hinged aluminum slat frames with integral rubber weatherseal between slats.
         2. Size: As shown.
         3. Bottom Bar: Extruded aluminum with electric with reversing edge.
      d. Door Type 2:
         1. General: Spiral FV Full Vision with manufacturers standard hinged aluminum slat frames with clear polycarbonate windows and integral rubber weatherseal between slats.
         2. Size: As shown.
         3. Bottom Bar: Extruded aluminum with electric with reversing edge.
      e. Side Frames:
         1. General: Manufacturers standard galvanized steel side frames and covers with full-height weatherseal.
         2. Door Track: Spiral rollup design.
      f. Counterbalance: As recommended by the manufacturer.
      g. Drive system:
         1. General: Manufacturers standard 3 HP variable-speed AC Drive motor.
         2. Travel Speed: 40 inches per second opening and 30 inche per second closing.
      h. Door Controls:
         1. General: Provide manufacturers standard radio controls, with panel, limit switches, photo eyes and reversing device.
         2. Radio Controls:
            a) General: Multi-frequency type; coordinate with Fire Department for type/frequency of controls.
            b) Motor Controllers: Manufacturers standard.
            c) Operator Antennas: Exterior mount; 12 inch to 18 inch size.
            d) Vehicle Transmitters: Provide forty (40).
         3. Exterior: Flush mounted keyed switch; open/close/stop station, momentary contact.
         4. Interior: Manufacturer's standard flush mounted three (3) button station.
      i. Safety Devices:
         1. Photo Eyes: Dual thru-beam type mounted at door jamb.
         2. Electric Reversing Edge: Full-width at bottom of door.
         3. Safety Light System: Pathwatch LED light strip mounted to door jambs at eye level, with amber lights flashing to indicate the door is about to close and redsteady to indicate the door is closing.

4. Wireless Bottom Bar: Manufacturers standard.

j. Manual Operation: Manufacturers standard mechanical release lever for push/pull operation.

2. Fasteners: As recommended by manufacturer; tamper proof type; anchors as shown.
3. Sealant: Refer to Section 07 92 10 - JOINT SEALERS.

3. EXECUTION:

A. PREPARATION:
1. Scheduling: Coordinate installation of bolts or other anchors built into concrete or masonry and identify exact location for installation.
2. Examination: Examine conditions of work in place before beginning work; report defects.
3. Measurements: Take field measurements; report variance between plan and field dimensions.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. High Speed Rolling Door:
   a. General: Set work plumb and true; properly assemble and erect in a rigid manner. Anchor assembly to building framing without distortion or stress; securely brace components suspended from structure. Fit and align assembly including hardware to provide smooth operation.
   b. Hardware: Install door operators per manufacturer's instructions; locks per Section 08 71 00 - DOOR HARDWARE.
   c. Tolerances: Maintain dimensional tolerances and alignment with adjacent work; maximum variation from plumb or level of 1/16 inch and maximum longitudinal or diagonal warp of plus or minus 1/8 inch per 10'-0" straight edge.
   d. Door Controls: Install where shown; coordinate installation of electrical service with Division 26 - ELECTRICAL. Complete wiring from disconnect to unit components and from fire alarm system to door.
3. Sealants: As shown; refer to Section 07 92 10 - JOINT SEALERS.

C. FIELD QUALITY CONTROL After installation, demonstrate that each door operates properly and that special features function within requirements.

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ALUMINUM ENTRANCE AND STOREFRONT Section 08 41 13

1. GENERAL:

A. SUMMARY: Provide Aluminum Entrance and Storefront, as shown and specified per Contract Documents.

B. REFERENCES:
1. Aluminum Association (AA): The Surface Treatment and Finishing of Aluminum and its Alloys.
2. Aluminum Anodizers Council (AAC): Finishing standards.
3. American Architectural Manufacturers Association (AAMA):
   a. General: Metal Curtainwall, Window, Store Front and Entrance Guide.
   b. SFM-1: Aluminum Storefront and Entrance Manual.
   c. AAMA 501 and 503: Standards for field testing storefront systems.
4. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
5. Americans with Disabilities Act (ADA):
   a. General: Americans with Disabilities Act of 1990, ADA - 42 U.S. Code Chapter 126.
   b. ADA Standards for Accessible Design: U.S. Department of Justice, 28 CFR Part 36.
6. Door Hardware Institute (DHI): Installation Builder's Hardware.
7. National Fire Protection Association (NFPA):
   a. NFPA 80: Fire Doors and Windows.
   b. NFPA 252: Fire Tests for Door Assemblies.
8. Underwriters Laboratories, Inc. (UL): UL 10B - Fire Tests for Door Assemblies.

C. SUBMITTALS:
1. General: Submit product data, shop drawings and samples.
2. Certification: Storefront shall bear a permanently installed "AAMA Prime and Replacement Label" bearing the manufacturer's name, product series number, grade and class designations. Do not install label in exposed location.
3. Closeout: Submit maintenance data and guarantee in required form for a period of two (2) years from date of final acceptance by Owner.

D. QUALITY ASSURANCE:
1. Design Requirements: Aluminum frame members must span vertically to withstand 25 psf wind load, minimum, per CBC; provide internal reinforcing as required; maximum deflection of L/175 of clear span or maximum of 3/4 inch.
2. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience; manufacturer approved. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
1. LEED Certification Requirements:
   a. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory.
   b. Environmental Standards: Comply with Green Seal Standard GS-13.
   c. Recycled Aluminum Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost) of the total value of the materials for the project.
2. Entrance and Storefront:
   a. General: Series FG-3000 Window Wall manufactured by Oldcastle Glass Vistawall.
   b. Alternate Manufacturers: Comparable products manufactured by Kawneer Co., Inc., or approved equal.
   c. Doors:
      1. General: Model Preformax Wide Stile WS-500 Door an Frame with 10 inch base rail; provide mohair pile weatherstripping where required.
      2. Hardware: Per Section 08 71 00 - DOOR HARDWARE.
   d. Fire Rated Storefront: "Fireframes Aluminum Series" fire-rated frame system manufactured by Technical Glass Products, or approved equal.
   e. Finish: Manufacturer's standard anodic; color as selected by City Representative.
3. Glass and Glazing: As shown; refer to Section 08 81 00 - GLASS GLAZING.
4. Fasteners: As recommended by manufacturer to meet wind pressures shown.
5. Protective Coatings:
   a. General: Bituminous, FS TT-C-494, Type II.

b. Gasketing: Chromate type.
6. Sealant: Refer to Section 07 92 10 - JOINT SEALERS.

3. EXECUTION:

A. PREPARATION:
1. Environmental Requirements: Do not install sealants when temperature is less than 40 degrees F.
2. Examination: Examine conditions of work in place before beginning work; report defects.
3. Measurements: Take field measurements; report variance between plan and field dimensions.
4. Protection: Protect prefinished components with wrapping or strippable coating; adhesive papers and sprayed coatings not acceptable.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Storefront:
   a. General: Install level, plumb, straight and aligned with adjacent surfaces, with hairline watertight joints; free of dents, buckles, twists, or other imperfections, as shown. Install flashings where shown.
   b. Anchorage:
      1. General: Anchor to adjacent structure; permit sufficient adjustment to accommodate construction tolerances and other irregularities. Use No. 12 sheet metal screws, or wood screws at 18 inches on center with a minimum of 1 inch penetration into structure.
      2. Tolerances: Maximum variation from plumb of 0.06 inch every 3'-0" non-cumulative or 1/16 inch per 10'-0", whichever is less. Maximum misalignment of two (2) adjoining members abutting in plane of 1/32 inch.
   c. Thermal Isolation: Provide where components penetrate or disrupt building insulation. Coordinate attachment and seal of perimeter air and vapor barrier materials.
3. Glazing:
   a. General: As specified under Section 08 81 00 - GLASS GLAZING.
   b. Glazing Stops: Anchor glass holding assemblies with frame clips and machine screws.
4. Doors:
   a. General: Hang doors level, plumb, straight in vertical plane, with proper fit and alignment and moving parts operating freely without bind.
   b. Weatherstripping: Seal doors, meeting stiles of pairs of doors, door tubing, and stops on frames and astragals.
   c. Thresholds: Set in bed of sealant and secure.
   d. Hardware: Per Section 08 71 00 - DOOR HARDWARE.
5. Dissimilar Materials: Isolate from other metals, plaster or concrete.
6. Sealant: Install per Section 07 92 10 - JOINT SEALERS.

C. Adjustment: Prior to acceptance, adjust moveable parts to assure smooth operation.

D. Cleaning:
1. Glass: Upon completion, remove labels and thoroughly clean glass surfaces.
2. Aluminum: Remove protective covering per manufacturer's instructions. Clean aluminum surfaces of stains, marks, or other defects, using soap and clean water.

* * *

FIRE RATED ALUMINUM ENTRANCES Section 08 42 53

1. GENERAL:

A. SUMMARY: Provide Fire Rated Aluminum Entrances, as shown and specified per Contract Documents.

B. REFERENCES:
1. Aluminum Association (AA): The Surface Treatment and Finishing of Aluminum and its Alloys.
2. Aluminum Anodizers Council (AAC): Finishing standards.
3. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   b. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
   c. ASTM E152: Methods of Fire Tests of Door Assemblies.
   d. ASTM E2110: Standard Test for Positive Pressure of Fire Tests of Window Assemblies.
4. American National Standards Institute (ANSI): ANSI Z97.1 Standard for Safety Glazing Materials Used In Buildings.
5. Americans with Disabilities Act (ADA):
   a. General: Americans with Disabilities Act of 1990, ADA - 42 U.S. Code Chapter 126.
   b. ADA Standards for Accessible Design: U.S. Department of Justice, 28 CFR Part 36.
6. Door Hardware Institute (DHI): Installation Builder's Hardware.
7. Glass Association of North America (GANA):
   a. General: GANA Glazing Manual.
   b. Glazing Sealants: GANA Sealant Manual.
8. National Fire Protection Association (NFPA):
   a. NFPA 80: Fire Doors and Windows.
   b. NFPA 251: Fire Tests of Building Construction and Materials.
   c. NFPA 252: Fire Tests of Door Assemblies.
   d. NFPA 257: Fire Tests of Window Assemblies.
9. Underwriters Laboratories, Inc. (UL):
   a. UL 9: Standard for Safety of Fire Tests of Window Assemblies.
   b. UL 10B: Standard for Safety of Fire Tests of Door Assemblies.
   c. UL 10C: Standard for Safety of Positive Pressure Fire Tests of Door Assemblies.
   d. UL 263: Fire Tests of Building Construction and Materials.
10. U.S. Consumer Product Safety Commission (CPSC): 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

C. SUBMITTALS:
1. General: Submit product data and shop drawings.
2. Closeout: Submit maintenance data, and guarantee in required form for a period of five (5) years from date of final acceptance by Owner.

D. QUALITY ASSURANCE:
1. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
1. LEED Certification Requirements:
   a. VOC Materials Compliance:
      1. General: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory and the following:
      2. Windows, Glass Doors and Skylights: Green Seal Standard GS-13.
      3. Commercial Adhesives: Seal Standard GS- 36.
   b. Recycled Metal Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost) of the total value of the materials for the project.
2. Fire Rated Aluminum Entrances:
   a. General: GPX Architectural Series manufactured by SAFTI*FIRST*.
   b. Alternate Manufacturers: Comparable products manufactured by Technical Glass Products, or approved equal.
   c. Doors:
      1. Single: Model No. GPX-DS-20P-SLI.

2. Pair Doors: Model No. GPX-DP-20P-SLI.
3. Hardware: Specified under Section 08 71 00 - DOOR HARDWARE.

d. Wall/Window: Manufacturer's standard GPX Series.
e. Glass:
1. General: Manufacturer's standard Superlite 1 for 20 minute rating.
2. Glazing Accessories: Manufacturer's standard for 20 minute rating.
f. Finish: Manufacturer's standard; color anodic per AAMA 606.1, color as selected by the City Representative.

3. Protective Coatings:
a. General: Bituminous, FS TT-C-494, Type II.
b. Gasketing: Chromate type.
4. Fasteners and Anchors: As recommended by manufacturer.
5. Sealant: As recommended by manufacturer.

B. FABRICATION:
1. General: Fabricate as shown. Provide knocked down for field assembly for field glazing.
2. Hardware: Factory prepare for field mounting of hardware; refer to Section 08 71 00 - DOOR HARDWARE.

3. EXECUTION:

A. PREPARATION:
1. Examination: Examine conditions of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.
3. Protection: Protect prefinished components with wrapping or strippable coating; adhesive papers and sprayed coatings not acceptable.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Wall/Window:
a. General: Install level, plumb, straight and aligned with adjacent surfaces, with hairline joints; free of dents, buckles, twists, or other imperfections.
b. Anchorage:
1. General: Anchor to adjacent structure; permit sufficient adjustment to accommodate construction tolerances and other irregularities.
2. Tolerances: Maximum variation from plumb of 0.06 inch every 3'-0" non-cumulative or 1/16 inch per 10'-0", whichever is less. Maximum misalignment of two (2) adjoining members abutting in plane of 1/32 inch.
3. Doors:
a. General: Hang doors level, plumb, straight in vertical plane, with proper fit and alignment and moving parts operating freely without bind.
b. Hardware: Refer to Section 08 71 00 - DOOR HARDWARE.
4. Glass: Install as shown, per manufacturers instructions.
5. Dissimilar Materials: Isolate from other metals, plaster or concrete.
6. Sealant: Install per Section 07 92 10 - JOINT SEALERS.
7. Adjustment: Prior to acceptance, adjust moveable parts to assure smooth operation.
8. Cleaning:
a. Glass: Upon completion, remove labels and thoroughly clean glass surfaces.
b. Aluminum: Remove protective covering per manufacturer's instructions. Clean aluminum surfaces of stains, marks, or other defects, using soap and clean water.

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VINYL WINDOWS Section 08 53 13

1. GENERAL:

A. SUMMARY: Provide Vinyl Windows, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Architectural Manufacturers Association (AAMA):
      a. AAMA 101: Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
      b. AAMA 502: Standard method for field testing and verification of final window installation.
   2. American Society for Testing and Materials (ASTM):
      a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
      b. ASTM E283: Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
      c. ASTM E330: Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
      d. ASTM E331: Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
   3. Glass Association of North America (GANA): Glazing Manual.
   4. National Fenestration Rating Association (NFRA): NFRC 100 - Procedure for Determining Fenestration Product Thermal Properties (Currently Limited to U-Value).
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Certification: Apply a permanently installed "AAMA Prime and Replacement Label" to the window unit bearing the manufacturer's name, product series number, grade and class designations. Do not install label in exposed location.
   3. Test Reports: Submit report by independent testing laboratory verifying that deflection, water resistance, air infiltration, fabrication workmanship, and torsion resistance of window meets requirements of AAMA 101.
   4. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE:
   1. Design Criteria:
      a. General: ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
      b. Requirements: Frame members must span vertically to withstand 25 psf wind load, minimum, per CBC; provide internal reinforcing as required; maximum deflection of L/175 of clear span or maximum of 3/4 inch.
   2. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Vinyl Windows:
      a. General: Manufactured by Milgard Windows; configuration and sizes as shown.
      b. Alternate Manufacturers: Comparable products manufactured by the Pella Corp., or approved equal.
      c. Horizontal Sliding: Montecito Series Horizontal Sliding Window.
      d. Fixed Frame: Montecito Series Picture Window.
      e. Casement: Montecito Series Casement Window.
   2. Glass:
      a. General: As shown; specified under Section 08 81 00 - GLASS GLAZING.
      b. Glazing: Manufacturer's standard.
   3. Screens: At operable windows; 18x16 mesh aluminum; in manufacturer's standard frame.
   4. Hardware: Manufacturer's standard; white.
   5. Finish:
      a. Interior: Manufacturer's standard white.
      b. Exterior: As shown.
B. FASTENERS: As recommended by manufacturer.
C. SEALANT: Refer to Section 07 92 10 - JOINT SEALERS.

3. EXECUTION:

A. PREPARATION:
   1. Environmental Requirements: Do not install sealants when temperature is below 40 degrees F.

2. Examination: Examine conditions of work in place before beginning work; report defects.
3. Measurements: Take field measurements; report variance between plan and field dimensions.
4. Protection: Maintain labels and protect glass until final acceptance.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Attachment:
   a. General: Align window plumb and level, free of warp or twist. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities. Maintain dimensional tolerances; align with adjacent work.
   b. Tolerances: Maximum variation from level or plumb of 0.06 inches every 3'-0" non-cumulative or 0.5 inches per 100'-0", whichever is less.
3. Thermal Insulation: Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier. Coordinate attachment and seal of perimeter air and vapor barrier materials.
4. Flashing: Coordinate as required with Section 07 60 00 - FLASHING AND SHEET METAL.
5. Hardware: Install per manufacturer's instructions.
6. Glazing: Install per Section 08 81 00 - GLASS GLAZING.
7. Sealant: Install per Section 07 92 10 - JOINT SEALERS; apply as shown, make installation fully watertight.

* * *

UNIT SKYLIGHTS Section 08 62 00

1. GENERAL:

A. SUMMARY: Provide Unit Skylights, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Architectural Manufacturers Association (AAMA):
      a. AAMA 605.2: Application Process for Thermosetting Acrylic Finish.
      b. AAMA 606.1: Application of Color Anodic Finishes.
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   3. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE:
   1. Qualifications:
      a. General: Skylight unit California State Fire Marshal listed.
      b. Installer: Specialized in performing the work of this Section with minimum two (2) years experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Unit Skylights:
      a. General: Standard Dome manufactured by O'Keeffe's, Inc.
      b. Alternate Manufacturers: Comparable products manufactured by Sunoptics, or approved equal.
      c. Size: As shown.
      d. Glazing:
         1. General: Manufacturer's standard double glazed, with white] inner lens.
         2. Plastic: Acrylic with UV protective coating.
      e. Finish: Manufacturer's standard Clear - Class 1 anodic coating per AA-M12C22-A41.
      f. Louver Shades: Refer to Section 12 21 00 - WINDOW BLINDS.
   2. Fasteners: As shown.
   3. Protective Coating: FS TT-C-494, Type II.
   4. Sealant: Refer to Section 07 92 10 - JOINT SEALERS.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Skylights: Install to established lines and levels; shim curb as required, anchor to structure and make watertight. Provide continuous bead of sealant between frame and curb.
   3. Dissimilar Materials: Separate aluminum and other metals with specified protective coating.
C. FIELD QUALITY CONTROL:
   1. General: Perform NAAMM Standard FC-1, Water Penetration Test after erection.
   2. Retesting: Make necessary corrections to non-conforming work; retest at Contractor's expense.

* * *

TUBULAR SKYLIGHTS Section 08 62 23

1. GENERAL:

A. SUMMARY: Provide Tubular Skylights, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Architectural Manufacturers Association (AAMA):
      a. AAMA 605.2: Application Process for Thermosetting Acrylic Finish.
      b. AAMA 606.1: Application of Color Anodic Finishes.
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   3. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE:
   1. Qualifications:
      a. General: Skylight unit California State Fire Marshal listed.
      b. Installer: Specialized in performing the work of this Section with minimum two (2) years experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Tubular Skylights:
      a. General: Manufactured by Solatube International, Inc., length and ceiling mount as shown.
      b. Alternate Manufacturers: Comparable products manufactured by Daylighting Technologies, Inc., or approved equal.
      c. Type: SolaMasters Series, 750 DS.
      d. Diffuser: OptiView, with Warm Effect Lens.
      e. Flashing: Curb Mounted as shown.
   2. Fasteners: As shown.
   3. Protective Coating: FS TT-C-494, Type II.
   4. Sealant: Refer to Section 07 92 10 - JOINT SEALERS.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Skylights: Install to established lines and levels; shim curb as required, anchor to structure and make watertight. Provide continuous bead of sealant between frame and curb.
   3. Dissimilar Materials: Separate aluminum and other metals with specified protective coating.
C. FIELD QUALITY CONTROL:
   1. General: Perform NAAMM Standard FC-1, Water Penetration Test after erection.
   2. Retesting: Make necessary corrections to non-conforming work; retest at Contractor's expense.

* * *

DOOR HARDWARE Section 08 71 00

1. GENERAL:

A. SUMMARY: Provide Door Hardware, as shown and specified per Contract Documents.

B. REFERENCES:

1. Americans with Disabilities Act (ADA):
   a. General: Americans with Disabilities Act of 1990, ADA - 42 U.S. Code Chapter 126.
   b. ADA Standards for Accessible Design: U.S. Department of Justice, 28 CFR Part 36.
2. American National Standards Institute (ANSI): ANSI A117.1 and the California Code of Regulations, Title 24.
3. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers standard specifications.
4. Architectural Woodwork Institute (AWI): Quality standards.
5. Builders Hardware Manufacturers Association (BHMA): Hardware standards.
6. California Building Code (CBC): Hardware standards.
7. Door and Hardware Institute (DHI): Hardware standards.
8. National Fire Protection Association (NFPA): NFPA 252.
9. Underwriters Laboratories, Inc. (UL):
   a. UL 10B: Fire Test for Door Assemblies.
   b. UL 305: Panic Hardware.
10. Woodwork Institute (WI): Manual of Millwork.

C. SUBMITTALS:

1. General:
   a. General: Submit product data, test reports, certificates and as follows:
   b. Shop Drawings:
      1. General: Submit detailed finish hardware schedule in vertical format as follows:
      2. List groups and suffixes in proper sequence.
      3. Completely describe door and list architectural door number.
      4. Provide name of manufacturer, product name, catalog number, function, type, style, size and finish of each item.
      5. Show mounting locations.
      6. Explain abbreviations and symbols used in schedule.
      7. Provide detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment, and access control equipment, and door and frame rough-ins required for specific opening.
   c. Samples:
      1. General: If specifically requested for specified products; required for alternate products.
      2. Substitutions Requests: Refer to Section 01 25 00 - SUBSTITUTION PROCEDURES. Submit schedule and sample of each item proposed for substitution. Clearly mark each sample indicating type of item, manufacturer's name, catalog number and item for which it is proposed to be substituted.
      3. Disposition: Accepted samples may be used in work; rejected samples will be returned.
2. Closeout:
   a. Maintenance Data: Provide manufacturer's instructions and special maintenance tools and accessories as required. Provide three copies of the lock service manual.
   b. Guarantee:
      1. General: Provide in required form for a period of one (1) year from date of final acceptance by Owner and as follows:
      2. Manufacturer's Warranty:
         a) Door Closers: Ten (10) years.
         b) Exit Devices: Three (3) years.
         c) Locksets and Cylinders: Five (5) years.
         d) All Other Hardware: Two (2) years.

D. QUALITY ASSURANCE:

1. Manufacturers: Specializing in production of institutional and commercial door hardware for a minimum of five (5) years.
2. Supplier:
   a. General: A firm specializing in the supply and servicing of institutional and commercial door hardware for at least five (5) years.
   b. Personnel: Employ an Architectural Hardware Consultant (AHC or DAHC), accredited by the Door and Hardware Institute (DHI), to supervise detailing and supply of material for the Project. If requested, inspect final installation and report problems and suggested corrective measures to the City Representative.

3. Coordination:
   a. General: Apply hardware to aluminum or metal doors and frames, and factory prepared wood doors and frames, to template; provide two (2) copies of accepted Finish Hardware Schedule for use by door and frame suppliers.
   b. Distribution: Furnish two (2) copies of each template to manufacturers who are not listed as current template book holders; furnish two (2) copies of each template for items whose manufacturers do not provide registered template book.

2. PRODUCTS:

A. MANUFACTURERS:
   1. Catalog numbers of manufacturers listed in Column 1 have been used in hardware sets. Manufacturers listed in Columns 2 & 3 are approved substitutes. Supply products from one of the listed manufacturers. No other manufacturers will be considered.

ITEM	1	2	3
Continuous Gear Hinges	Hager	Stanley	McKinney
Hinges	Hager	Stanley	McKinney
Flush Bolts and Coordinators	Hager	Rockwood	Trimco
Mortise Locksets	Best Access Systems	Folger Adams with Best Cylinder	
Exit Devices	Von Duprin	Precision	Dorma
Closer	Sargent	Norton	LCN
Auxiliary Hardware			
Kick Plates, Stops	Hager	Rockwood	Trimco
Threshold & Weatherstrip	Hager	Pemko	Reese
Remote Release Switch	SDC Security Door Controls	Securitron	

B. CONTINUOUS GEAR HINGES: Grade 1, Aluminum, Heavy Duty Concealed Leaf Hinge. Hager Companies 780-224HD; Stanley 662HD; McKinney MCK25HD.
C. HINGES: Grade 1, ANSI/BHMA A156.1, ANSI A8112, Standard weight, Stainless steel, Button Tip. Hager Companies BB1191;Stanley FBB191; Mc Kinney TA2314.
D. FLUSH BOLTS AND COORDINATORS: ANSI/BHMA A156.16, Grade 1.
E. MORTISE LOCKSETS AND LATCHES: Grade 1, ANSI A156.13, Series 1000 Operational and Security, Sectional Trim. Best Access Systems 40H Series; Folger Adams D9300 Series with Best Access systems Cylinder.
   1. Locks and latches shall be of one manufacturer as listed for continuity of design and consideration of warranty.
   2. Standards: Product to be certified and listed by following:
      a. ANSI/BHMA A156.13 Series 1000 Certified to Grade 1 for Operational and Security.
      b. UL/cUL Labeled and listed for functions up to 3 hours for single doors up to 48" in width and up to 96" in height.
      c. UL10C/UBC 7-2 Positive Pressure Rated.
      d. ICC/ANSI A117.1.
   3. Lock and latch function numbers and descriptions of manufacturer's series as listed in hardware sets.
   4. Material and Design:
      a. Solid one-piece stainless steel anti-friction latch provides 50% more surface contact with strike for superior strength and security. Reversible latch rotates 180 degrees for easy handing change without opening case. Precision-engineered curve provides enhanced cycle life with reduced wear to the strike.
      b. Non-handed cylinder retainer and stainless steel auxiliary bolt for ease of changing hand.
      c. Armored front completely surrounds latch and deadbolt providing increased lateral strength. Staked assembly design allows the armored front to self-align with the door bevel during installation.
      d. Enhanced case integrity achieved through four case cover screws (one at each corner), plus interlocking armored front and cover design at the latch.
      e. Roller bearing hub mechanism provides smooth, wear resistant operation.
      f. Locking toggle includes clear indication of "locked" and "unlocked" states.
      g. 40H case, cover, and armored front manufactured from 0.095" cold rolled steel for strength and durability.
      h. Fusible link.
      i. Four position hub toggle design determines whether each hub is always locked, always unlocked, or locked by key for easy handing change without opening case.
      j. Lever return spring mechanism located in trim for enhanced protection against lever droop, providing a firm, positive return of the lever to the horizontal position.
      k. Self-aligning trim mechanism for fast, easy, and accurate installation.
      l. Curved lip strike and strike box assembly provides an aesthetic, non-handed solution to

complement field reversible case.
m. Solid machined cylinder rings with tension spring provide resistance to wrenching of cylinder. Cylinder security screw prevents removal of cylinder without first removing interchangeable core.
n. Levers shall be cast solid; hollow levers will not be allowed.
o. Mortise locks shall have a standard 5 year warranty.

F. EXIT DEVICES: Grade 1, ANSI A156.3, Heavy Duty, UL/cUL Listed for up to 3 hours for "A" label doors, UL10C/UBC 7-2 (1997) Positive Pressure Rated, UL10B Neutral Pressure Rated. UL305 Listed for panic hardware, complies with ANSI 117.1 for accessible buildings and facilities. Von Duprin 99 Series; Precision Apex Series; Dorma 5000 Series.

G. KEY SYSTEM: Best Access Systems, 7 Pin, Interchangeable Core keyed to the existing factory-registered Grand Master Key System to match San Diego Fire Department Design Standard - no substitution. All 7 Pins to be operable; furnish permanent cores to City Lock Shop for final installation unless provided by manufacturer; temporary cores (construction cores) shall be installed by Contractor for security purposes; temporary cores shall be keyed alike and interchangeable with Best cores, cores provided by the manufacturer. Contractor shall provide to the City Lock Shop copies of Control Key and Operating Keys upon completion. All keys and cores shall have visual key control. All keys shall be stamped "Do Not Duplicate". The Electric Meter Room shall have S.D.G.&E. lock installed; the cylinder shall be keyed to Schlage keyway VTQP AA-10; provide 3 keys with lock. All keys are to be turned over to the City of San Diego Lock Shop at completion of the project. The Contractor shall obtain lock from a contracted S.D.G.&E. locksmith for installation. Contact the Carpentry and Lock Shop Building Maintenance Supervisor Mr. Calvin Yeldell (619) 525-8534.

H. CLOSER: Grade 1, ANSI A156.4 adjustable sizes 2 - 6 / ADA Compliant ANSI A117.1 sizes 1 - 4; Aluminum alloy body with full cover; painted finish. Sargent 351 Series; Norton 7500 Series; LCN 4000 Series.

I. AUXILIARY HARDWARE (KICK PLATES, STOPS): Grade 1 ANSI A156.6 J102 Metal Kick Plate, 0.050 thickness, beveled 4 sides. Stops: Grade 1 ANSI A156.16.

J. THRESHOLD AND WEATHERSTRIP: Grade 1, Aluminum.

K. REMOTE RELEASE SWITCH: Under desk mount, momentary push switch. SDC Security Door Controls; Securitron.

3. EXECUTION:

A. PREPARATION:
1. Examination: Examine conditions of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.
3. Delivery:
a. Packaging: Identify door number, hardware type, location and hand of door on each package.
b. Keys: Label and deliver keys by registered mail or personal messenger directly to City Representative.

B. APPLICATION:
1. General: Install in strict conformance with referenced standards, the manufacturer's written directions, as shown, and as herein specified.
2. Hardware Placement:
a. General: Except for hinges, do not install hardware until completion of painting and finishing work. Unless otherwise shown, place hardware at following height above finish floor:
b. Strike (Centerline) for Locks and Latches: Between 40 inches and 42 inches.
c. Hinges: Manufacturer's standard.
d. Door Pull (Centerline): 42 inches.
e. Push Plate (Centerline): 44 inches.
f. Deadlocks (Centerline of Cylinder): 44 inches.
3. Floor Clearances:
a. Labeled Doors: 3/8 inch maximum over floor or threshold.
b. No Threshold: 3/4 inch maximum for metal doors; 5/8 inch maximum for wood doors.
c. Threshold: 1/8 inch typical.
d. Carpet: 1/8 inch over top of nap, unless otherwise shown.
4. Installation:
a. General: Install hardware in precise manner; door clearance and hardware placement as specified. Predrill pilot holes in wood for screws. Drill and tap for surface mounted hardware on metal.
b. Hinges: Set hinge leaves snug and flat in mortises; turn screws to flat seat (do not drive). Drive hinge pins down and tighten set screws.
c. Closers: Mount door closers for maximum swing of door before setting stops.
d. Silencers: Set in place before adjusting strikes.

e. Locksets: Install locks with keyways in proper position; levers, roses and escutcheons firmly attached.
f. Thresholds: Set in waterproof sealant; secure with lead shields and countersunk screws of same finish as threshold.

C. ADJUSTMENT AND MAINTENANCE:
1. General: Prior to acceptance, adjust moveable parts to assure smooth operation.
2. Door Closers: Adjust for closing speed, latching speed, back checking, and hold-open devices for full control of door. Adjust operation of doors to require a maximum of 5.0 lbs. for exterior doors; 5.0 lbs. for interior doors; and 15 lbs. for fire doors.

D. HARDWARE SCHEDULE:

Heading # 1
Paired Doors, Exterior from Electrical Room
(2) 3'0" x 6'8" x 1 ¾" HM Door x HM Frame
Door: 112A

6 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Keyed Removable Mullion	KR4954	600	VN
2 ea.	Exit Device	99L-NL-17	630	VN
1 ea.	Mortise Cylinder (Mullion)	1E74	626	BE
1 ea.	Rim Cylinder	1E72	626	BE
2 ea.	Closer w / Stop Arm	351 PS	689	SA
2 ea.	Meeting Stile Weatherstrip	802S B	MIL	HA
2 ea.	Door Sweep	770S B	MIL	HA
1 ea.	Threshold	438S	MIL	HA
1 set	Weatherstrip	726S	CHA	HA

Heading # 2
Paired Doors, Exterior from SCBA and Hose Storage
(2) 3'0" x 6'8" x 1 ¾" HM Door x HM Frame
Door: 103A

6 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 set	Self-Latching Flush Bolt	293D	626	HA
1 ea.	Coordinator	297D x Mounting Brackets	600	HA
1 ea.	Dust Proof Strike	280X	626	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
2 ea.	Kick Plate	194S 10" High	630	HA
2 ea.	Overhead Stop / Hold-Open	7017 CON	630	HA
2 ea.	Meeting Stile Weatherstrip	802S B	MIL	HA
2 ea.	Door Sweep	770S B	MIL	HA
1 ea.	Threshold	438S	MIL	HA
1 set	Weatherstrip	726S	CHA	HA

Heading # 3
Paired Doors, Exterior from Kitchen – Dining / Exercise Room
(2) 3'0" x 6'8" x 1 ¾" Glass / Aluminum Door x Aluminum Frame
Door: 105A, 107B

6 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 set	Self-Latching Flush Bolt	293D	626	HA
1 ea.	Coordinator	297D x Mounting Brackets	600	HA
1 ea.	Dust Proof Strike	280X	626	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
2 ea.	Closer w / Hold Open Stop Arm	351 CPSH	689	SA
2 ea.	Meeting Stile Weatherstrip	802S B	MIL	HA
2 ea.	Door Sweep	770S B	MIL	HA
1 ea.	Threshold	438S	MIL	HA
	Weatherstrip	By Frame Supplier		

Heading # 4
Single Door, Exterior from **Lobby**
3'0" x 8'0" x 1 ¾" Glass / Aluminum Door x Aluminum Frame
Door: 115A

1 ea.	Pwr. Transfer Cont. Hinge	780-224HD ETW	628	HA
1 ea.	Electrified Exit Device	EL99L-NL-17	630	VN
1 ea.	Rim Cylinder	1E72	626	BE
1 ea.	Closer w / Stop Arm	351 CPS	689	SA
1 ea.	Accessibility Sign	369	BLUE	HA
1 ea.	Door Sweep	770S B	628	HA
1 ea.	Threshold	438S	628	HA
1 ea.	Rain Drip	810S	628	HA
1 ea.	Power Supply	PS900	-	VN
1 ea.	Remote Door Release Switch	15-2	BLK	SDC
1 ea.	Call Button			
1 ea.	Wiring Diagram			
	Weatherstrip	By Frame Supplier		

Description of Operation:
- Door is normally closed and secure.
- Keyed cylinder at exit device trim provided for authorized override access, door returns to locked position.
- Access may be granted at remote location (Lobby) unlocking exit device, then re-locking. City Representative to advise remote release location. Request for entry by Call Button.
- In the event of power loss or fire alarm condition, the door remains locked. (Fail Secure)
- Free and immediate egress at all times.

Heading # 5
Single Door, Exterior to Kitchen - Dining
3'0" x 6'8" x 1 ¾" Glass / Aluminum Door x Aluminum Frame
Door: 105B

3 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
1 ea.	Closer	351	689	SA
1 ea.	Floor Stop	259F	626	HA
1 ea.	Door Sweep	770S B	628	HA
1 ea.	Threshold	438S	628	HA
1 ea.	Rain Drip	810S	628	HA
	Weatherstrip	By Frame Supplier		

Heading # 6
Single Door, Exterior from **Hall**
3'0" x 6'8" x 1 ¾" Glass / Aluminum Door x Aluminum Frame
Door: 108E

3 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
1 ea.	Closer w / Hold Open Stop Arm	351 CPSH	689	SA
1 ea.	Floor Stop	269T	BLK	HA
1 ea.	Door Sweep	770S B	628	HA
1 ea.	Threshold	438S	628	HA
1 ea.	Rain Drip	810S	628	HA
	Weatherstrip	By Frame Supplier		

Heading # 7
Single Door, Exterior from Apparatus Bay
3'0" x 6'8" x 1 ¾" HM Door x HM Frame
Door: 101D

3 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
1 ea.	Closer	351 P10	689	SA
2 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Floor Stop	269T	BLK	HA
1 ea.	Door Sweep	770S B	MIL	HA
1 ea.	Threshold	438S	MIL	HA
1 set	Weatherstrip	726S	CHA	HA

Heading # 8
Single Door, Exterior from SCBA and Hose Storage
3'0" x 6'8" x 1 ¾" HM Door x HM Frame
Door: 103B

3 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
2 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Overhead Stop / Hold-Open	7017 CON	630	HA
1 ea.	Door Sweep	770S B	MIL	HA
1 ea.	Threshold	438S	MIL	HA
1 set	Weatherstrip	726S	CHA	HA

Heading # 9
Single Door, Exterior Deck from Hall / Battalion Chief
3'0" x 6'8" x 1 ¾" Glass / Aluminum Door x Aluminum Frame
Door: 212A; 217A

3 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Entry Lockset	45H 7AB 14H	630	BE
1 ea.	Closer	351	689	SA
1 ea.	Floor Stop	259F	626	HA
1 ea.	Door Sweep	770S B	628	HA
1 ea.	Threshold	438S	628	HA
1 ea.	Rain Drip	810S	628	HA
	Weatherstrip	By Frame Supplier		

Heading # 10
Single Door, Apparatus Bay from Hall
3'0" x 6'8" x 1 ¾" Glass / Aluminum Door x Aluminum Frame, 20 Minute Rated
Door: 108A, 108F

1 ea.	Continuous Gear Hinge	780-224HD	628	HA
1 ea.	Exit Device	99F-L-17	630	VN
1 ea.	Rim Cylinder	1E72	626	BE
1 ea.	Closer	351 P10	689	SA
1 ea.	Floor Stop	269T	BLK	HA
1 ea.	Door Sweep	802S B	MIL	HA
1 ea.	Threshold	413S	MIL	HA
	Weatherstrip	By Frame Supplier		

Heading # 10-A
Single Door, Apparatus Bay from Hall
3'6" x 6'8" x 1 ¾" Glass / Aluminum Door x Aluminum Frame, 20 Minute Rated (Door 117A)
Door: 117A

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Exit Device	99F-L-17	630	VN
1 ea.	Rim Cylinder	1E72	626	BE
1 ea.	Closer	351 P10	689	SA
1 ea.	Floor Stop	269T	BLK	HA
1 ea.	Door Sweep	802S B	MIL	HA
1 ea.	Threshold	413S	MIL	HA
	Weatherstrip	By Frame Supplier		

Heading # 11
Single Door, Hall to Storage / Janitor
3'0" x 6'8" x 1 ¾" SCW Door x HM Frame
Door: 209A, 214A

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
1 ea.	Closer	351	689	SA
1 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Wall Stop	232W	630	HA
3 ea.	Silencer	307D	GREY	HA

Heading # 12
Single Door, Hall from Electrical
3'0" x 6'8" x 1 ¾" SCW Door x HM Frame
Door: 215A

3 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
1 ea.	Closer	351	689	SA
1 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Wall Stop	232W	630	HA
3 ea.	Silencer	307D	GREY	HA

Heading # 13
Single Door, Wash Room from Medical Supplies
3'0" x 6'8" x 1 ¾" HM Door x HM Frame
Door: 102B

3 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
1 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Wall Stop	232W	630	HA
3 ea.	Silencer	307D	GREY	HA

Heading # 14
Single Door, Hall to Communication
3'0" x 6'8" x 1 ¾" HM Door x HM Frame
Door: 113A

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
1 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Wall Stop	232W	630	HA
3 ea.	Silencer	307D	GREY	HA

Heading # 15
Single Door, Hall from Storage / Elevator Equipment / Pole Landing from Mechanical
3'0" x 6'8" x 1 ¾" SCW Door x HM Frame
Door: 109A, 111A, 208A

3 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
1 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Overhead Stop	7016 CON	630	HA
3 ea.	Silencer	307D	GREY	HA

Heading # 16
Single Door, Apparatus Bay to Mechanical Equipment
3'0" x 5'0" x 1 ¾" HM Door x HM Frame, 20 Minute Rated
Door: 301A

2 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
1 ea.	Closer	351	689	SA
1 ea.	Floor Stop	269T	BLK	HA
1 set	Gasket	726S	CHA	HA

Heading # 17
Single Door, Mechanical Equipment to Attic
3'0" x 5'0" x 1 ¾" HM Door x HM Frame
Door: 301B

2 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Storeroom Lockset	45H 7D 14H	630	BE
1 ea.	Floor Stop	269T	BLK	HA
1 set	Weatherstrip Gasket	726S	CHA	HA

Heading # 18
Single Door, Lobby from Hall
3'0" x 6'8" x 1 ¾" Glass / Wood Door x HM Frame
Door: 115B

3 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Passage Latchset	45H L 14H	630	BE
1 ea.	Closer	351	689	SA
1 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Wall Stop	232W	630	HA
3 ea.	Silencer	307D	GREY	HA

Heading # 19
Single Door, Hall to Day Room
3'0" x 6'8" x 1 ¾" Glass / Wood Door x HM Frame
Door: 104A

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Classroom Lockset	45H 7R 14H	630	BE
1 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Overhead Hold Open Stop	7017 CON	626	HA
3 ea.	Silencer	307D	GREY	HA

Heading # 20
Single Door, Hall from Exercise Room
3'0" x 6'8" x 1 ¾" Glass / Wood Door x HM Frame
Door: 107A

3 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Classroom Lockset	45H 7R 14H	630	BE
1 ea.	Closer	351	689	SA
1 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Wall Stop	232W	630	HA
3 ea.	Silencer	307D	GREY	HA

Heading # 21
Single Door, Hall to Battalion Chief Office
3'0" x 6'8" x 1 ¾" SCW Door x HM Frame
Door: 216A

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Office Lockset	45H 7A 14H	630	BE
1 ea.	Closer	351	689	SA
1 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Floor Stop	259F	626	HA
1 set	Gasket (Sound)	726S	CHA	HA

Heading # 22
Single Door, Hall to FF Dorm
3'0" x 6'8" x 1 ¾" SCW Door x HM Frame
Door: 201A, 202A, 203A, 204A, 205A, 206A

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Privacy Lockset	45H N 14H	630	BE
1 ea.	Kick Plate	194S 10"High	630	HA
1 ea.	Roller Stop	272W	626	HA
1 set	Gasket (Sound)	726S	CHA	HA
1 ea.	Wall Stop	232W	630	HA

Heading # 23
Single Door, Hall to Captain's Dorm
3'0" x 6'8" x 1 ¾" SCW Door x HM Frame
Door: 220A, 222A

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Privacy Lockset	45H N 14H	630	BE
1 ea.	Closer	351	689	SA
1 ea.	Kick Plate	194S 10"High	630	HA
1 ea.	Wall Stop	236W	632	HA
1 set	Gasket (Sound)	726S	CHA	HA

Heading # 24
Single Door, Battalion Chief Office from Battalion Chief Dorm
3'0" x 6'8" x 1 ¾" SCW Door x HM Frame
Door: 217B

3 ea.	Hinge	BB1191 4 ½" x 4 ½" NRP	630	HA
1 ea.	Privacy Lockset	45H N 14H	630	BE
1 ea.	Wall Stop	236W	632	HA
1 set	Gasket (Sound)	726S	CHA	HA

Heading # 25
Single Door, Wash Room to Bath / Lobby to Restroom
3'0" x 6'8" x 1 ¾" HM Door x HM Frame
Door: 102C, 114A

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Privacy Lockset	45H N 14H	630	BE
1 ea.	Kick Plate	194S 10"High	630	HA
1 ea.	Mop Plate	194S 4" High	630	HA
1 ea.	Wall Stop	236W	632	HA
1 ea.	Sign	368U	BLUE	HA
1 set	Gasket (Sound)	726S	CHA	HA

Heading # 26
Single Door, Hall to Bath
3'0" x 6'8" x 1 ¾" SCW Door x HM Frame
Door: 210A, 211A, 213A

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Privacy Lockset	45H N 14H	630	BE
1 ea.	Closer	351	689	SA
1 ea.	Kick Plate	194S 10"High	630	HA
1 ea.	Mop Plate	194S 4" High	630	HA
1 ea.	Wall Stop	236W	632	HA
1 ea.	Sign	368U (Door 210A)	BLUE	HA
1 ea.	Sign	370U	BLUE	HA
1 set	Gasket (Sound)	726S	CHA	HA

Heading # 27
Single Door, Battalion Chief / Captain's Dorm to Bath
3'0" x 6'8" x 1 ¾" SCW Door x HM Frame
Door: 218A, 219A, 221A

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Privacy Lockset	45H N 14H	630	BE
1 ea.	Kick Plate	194S 10"High	630	HA
1 ea.	Wall Stop	236W	632	HA
1 set	Gasket (Sound)	726S	CHA	HA

Heading # 28
Single Door, Lounge from Pole Landing
3'0" x 3'6" x 1 ¾" SCW Door x Wood Frame
Door: 207A

1 ea.	Spring Hinge	1150 4 ½" x 4 ½"	630	HA
1 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Passage Latchset	45H L 14H	630	BE
1 ea.	Kick Plate	914S 10" High	630	HA
2 ea.	Silencer	308D	GREY	HA

Heading # 29
Single Door, Lounge to Pole Landing
3'0" x 6'8" x 1 ¾" Glass / Aluminum Door x Aluminum Frame, 20 Minute Rated
Door: 207B

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Exit Device	99F-L-BE-17	630	VN
1 ea.	Closer	351	689	SA
1 ea.	Floor Stop	259F	626	HA
	Weatherstrip	By Frame Supplier		

Heading # 30
Single Door, Apparatus Bay to Wash Room
3'0" x 6'8" x 1 ¾" HM Door x HM Frame
Door: 102A

3 ea.	Hinge	BB1191 4 ½" x 4 ½"	630	HA
1 ea.	Push Plate	30S 8" x 16"	630	HA
1 ea.	Pull Plate	H31E 4" x 16"	630	HA
1 ea.	Closer	351	689	SA
1 ea.	Kick Plate	194S 10" High	630	HA
1 ea.	Mop Plate	194S 4" High	630	HA
1 ea.	Wall Stop	232W	630	HA
1 ea.	Door Sweep	802S B	MIL	HA
1 ea.	Threshold	413S	MIL	HA
1 set	Weatherstrip	726S	CHA	HA

Heading # 31
Exterior Gates
Gate: 118A, 118B, 118C

1 ea.	Padlock	41B722T XSPL	606	BE
	Balance of Hardware by Gate Supplier			

* * *

GLASS GLAZING Section 08 81 00

1. GENERAL:

A. SUMMARY: Provide Glass and Glazing, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American National Standards Institute (ANSI):
      a. ANSI/ASTM E330: Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
      b. ANSI Z97.1: Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   3. Glass Association of North America (GANA): "Engineering Standards Manual" and "Glazing Manual".
   4. Insulating Glass Certification Council (IGCC): Rating standards.
   5. Laminators Safety Glass Association Division of GANA (LSGA): Standards Manual.
   6. Sealed Insulating Glass Manufacturers Association (SIGMA): SIGMA No. 64-7-2 - Specification for Sealed Insulating Glass Units.
C. SUBMITTALS:
   1. General: Submit product data; a List of Materials proposed for use with each glazing condition identified; samples if specifically requested; and certificates stating that products installed comply with U.S. Consumer Product Safety Commission Standards.
   2. Closeout:
      a. General: Submit maintenance data.
      b. Guarantee:
         1. General: Provide in required form for a period of one (1) year from date of final acceptance by Owner, except as follows:
         2. Float Glass: Per requirements of ASTM C1036 and ASTM C1048.
         3. Coated-Glass Products: Ten (10) years.
         4. Insulating Glass: Five (5) years.
         5. Fire Rated Glass: Five (5) years.
         6. Laminated Glass: Five (5) years.
         7. Sacrificial Anti-graffiti Window Coating Film: Seven (7) years.
D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. VOC Materials Compliance:
      a. General: Use only products that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory and the following:
      b. Adhesives and Sealants: Green Seal Standard GS-13.
      c. Window Films: Green Seal Standard GS-14.
   2. Manufacture:
      a. General: Manufactured by PPG Industries, Inc., Glass Group; unless otherwise indicated.
      b. Alternate Manufacturers: Comparable products manufactured by Viracon, Inc., or approved equal.
      c. Tempered Glass and Safety Glazing: Comply with United States Consumer Product Safety Commission's "Safety Standards for Architectural Glazing Materials" (16 CFR part 1201) category I or II, as applicable; CBC Section 2402A and 2406.
   3. Flat Glass:
      a. General: Clear 7/32 inch thick unless otherwise indicated; size as shown.
      b. Float Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, quality q3 glazing select.
      c. Tempered Glass: ASTM C1048, fully tempered with horizontal tempering; 1/4 inch thick minimum.
      d. Mirrored Glass: Refer to Section 10 28 13 - TOILET ACCESSORIES for glass in framed mirrors.
      e. Insulated Glass Units:
         1. General: Double pane with glass elastomer edge seal; outer pane specified Low-E glass, inner pane of 1/4 inch clear glass; inter pane space purged by dry air; total unit thickness of 1 inch; conforming to ASTM E2190 with IGCC class CBA rating.

2. Spandrel: Outer pane specified Ceramic Frit Glass, inner pane of 1/4 inch obscure glass.

f. Low E Glass:
   1. General: Solarban 60 manufactured by PPG Industries, Inc., Glass Group; thickness as shown.
   2. Alternate Manufacturers: Comparable products manufactured by Viracon, Inc., or approved equal.

g. Obscure Ceramic Frit Glass:
   1. General: Viraspan No. 5961 manufactured by Viracon, Inc.; thickness as shown; color and pattern as shown.
   2. Alternate Manufacturers: Comparable products manufactured by PPG Industries, Inc., Glass Group, or approved equal.

h. Obscure Glass:
   1. General: "Satin Etch" anealed and tempered glass manufactured by Culver Glass; thickness as shown.
   2. Alternate Manufacturers: Comparable products manufactured by Pilkington North America, Inc., or approved equal.

i. Fire Rated Glass:
   1. General: Specified products are manufactured by the Safti Division of O'Keefe's, Inc.
   2. Alternate Manufacturers: Comparable products manufactured by Technical Glass Products, or approved equal.
   3. 20 Minute: SuperLite I.

j. Sacrificial Anti-graffiti Window Coating Film:
   1. General: HanitaTEK Anti Graffiti XTRA manufactured by Hanta Coatings.
   2. Alternate Manufacturers: Comparable products manufactured by Madico, Inc., or approved equal.
   3. Thickness: 6mils.

4. Glazing Materials:
   a. General: Factory mixed materials recommended by glass manufacturer for each glazing condition. Provide glazing and bedding putties to match color of frame, sealants, tapes, and other materials necessary to perform glazing work. Provide setting blocks, shims, compression seals, felt and neoprene or vinyl glazing channels as required.
   b. Butyl Glazing Tape:
      1. General: 440 Tape as manufactured by Tremco, Inc.
      2. Alternate Manufacturers: Comparable products manufactured by the GE Sealants and Adhesives, or approved equal
   c. Accessories:
      1. General: Materials recommended by glass or glazing material manufacturer.
      2. Setting Blocks and Spacers: Neoprene chemically compatible with specified sealants.
      3. Glazing Points and Spring Wire Clips: Corrosion resistant.
      4. Filler Rod: Compressible synthetic rubber or foam.
      5. Primer-Sealers and Cleaners: As recommended by glass manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Environmental Requirements: Glaze in dry conditions; minimum temperature 40 degrees F during and 48 hours after installation of glazing compounds.
   2. Examination: Examine conditions of work in place before beginning work; report defects.
   3. Measurements: Take field measurements; report variance between plan and field dimensions.
   4. Delivery: Deliver with manufacturer's labels intact; do not remove until completion of final inspection.
   5. Protection: Protect glass from damage until occupancy of building; replace glass damaged or broken before final acceptance.
   6. Surface Preparation: Clean contact surfaces with solvent and wipe dry. Seal porous glazing channels or recesses with material compatible with sealer. Prime surfaces scheduled to receive sealant.

B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Glass:
      a. Dimensions: As shown; tolerances as recommended by manufacturer.
      b. Edges: Per referenced standards; nipped edges, or edges treated with abrasives, not acceptable.
   3. Glazing:
      a. General: Use glass as shown; glaze with glazing compound or glazing gaskets as required.
      b. Float Glass: Type and thickness, as shown.

c. Tempered Glass:
   1. General: Type and thickness, as shown.
   2. Heat Absorbing: Install at exterior, as shown.
d. Insulated Glass Units:
   1. General: Install on exterior, where shown.
   2. Low-E Glass: Install coated surface on inside of insulated glazed units.
   3. Spandrel: Ceramic frit surface on inside of insulated glazed units.
e. Obscure Ceramic Frit Glass: Install where shown.
f. Obscure Glass: Install where shown; set with pattern on interior side.
g. Fire Rated Glass: Install per UL Certification for rating as shown.
h. Sacrificial Anti-graffiti Window Coating Film: Install at exterior per manufacturers instructions without bubbles, ripples, drips, dirt, cuts, tears or gaps between film and frame.

* * *

FIXED LOUVERS Section 08 91 19

1. GENERAL:

A. SUMMARY: Provide Wall Louvers, as shown and specified per Contract Documents.

B. REFERENCES:
   1. Air Movement and Control Association International, Inc. (AMCA): AMCA 500/N - "Laboratory Method for Testing Louvers for Rating".
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.

C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Certificates: Submit AMCA certification for louvers specified.
   3. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience; manufacturer approved. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Metal Wall Louvers:
      a. General: Extruded Stationary Model No. K609/CB609, 45 degree straight louver manufactured by the Airolite Company.
      b. Alternate Manufacturers: Comparable products manufactured by Construction Specialties, Inc., or approved equal.
      c. Size: As shown.
      d. Primer: FS TT-P-641F, Type II.
      e. Bituminous Coating: Manufacturer's standard.
   2. Bird Screen:
      a. General: 1/2 inch mesh, 16 gage galvanized steel wire removable screen.
      b. Frame: Manufacturer's standard.
   3. Fasteners: Manufacturer's standard, compatible with fabricated items.
   4. Sealant: Refer to Section 07 92 10 - JOINT SEALERS; standard color selected by the City Representative.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.

B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Metal Wall Louvers:
      a. General: Install frame and blades plumb, straight and level. Anchor to structure as shown; provide sealant at perimeter for watertight installation.
      b. Mullions: Anchor top and bottom, as shown.
      c. Dissimilar Metals: Separate with heavy bituminous coating.
      d. Finish: Touch-up abrasions to shop prime coat as required; finish provided under Section 09 91 00 - PAINTING.
   3. Ductwork: Connect ducts to louvers; refer to Division 23 - HEATING, VENTILATING AND AIR CONDITIONING.
   4. Bird Screen: Install at exterior louvers.

* End Division 08 *

Division 09 - FINISHES

SYNTHETIC CEMENT PLASTER Section 09 24 18

1. GENERAL:

A. SUMMARY: Provide Synthetic Cement Plaster, as shown and specified per Contract Documents.

B. REFERENCES:
1. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   b. ASTM C1068: Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
2. Northwest Wall and Ceiling Bureau (NWCB): Stucco Resource Guide.
3. Portland Cement Association (PCA): Portland Cement Plaster/Stucco Manual.
4. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
5. Western Wall and Ceiling Contractors Association (WWCCA): Exterior Lathing and Plastering Technical Bulletins.

C. SUBMITTALS:
1. General: Submit product data.
2. Samples: Submit manufacturer's standard colors and textured finishes other than smooth.
3. Closeout: Submit maintenance data and guarantee in required form for a period of Ten (10) years from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
1. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS- 36.
2. Synthetic Cement Plaster:
   a. General: Diamond Wall One Coat System manufactured by Omega Products International, Inc., unless otherwise indicated.
   b. Alternate Manufacturers: Comparable products manufactured by Parex, Inc., or approved equal.
   c. Bonding Agent: BondCrete, liquid polyvinyl bonding agent.
   d. Primer: AkroFlex Base Primer, acrylic base primer.
   e. Reinforcement: Reinforcing Mesh; 4.5 ounce, alkali resistant, woven fiber mesh.
   f. Plaster:
      1. Vertical Construction: Diamond Wall PM Concentrate and Admixture.
      2. Horizontal Construction: StyroGlue Plus Base, 100% polymer based, fiber reinforced, water resistant base coat.
   g. Finish Coat:
      1. New Surfaces:
         a) General: AkroFlex Desert Series, 100% acrylic finish.
         b) Color and Texture: As selected by the City Representative.
      2. Repaired Surfaces:
         a) General: OmegaFlex 100% acrylic finish.
         b) Texture: Match existing; paint per Section
3. Aggregate: Sand per ASTM C897.
4. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.
5. Lath:
   a. General: Conform to CBC Table 25A-B for lath types, weights, attachments and support spacing, except where otherwise noted.
   b. Wire Mesh Reinforcement: ASTM C1032 woven wire mesh; 1-1/2 inches x 1-1/2 inches x 17 gage galvanized.
   c. Expanded Metal Lath: 3.4 lbs. per square foot. Use 3/8 inch riblath where shown and where supports are more than 16 inches and less than 24 inches on center.
   d. Lathing Accessories:
      1. Fasteners:
         a) Screws: Galvanized Type S bugle head; sizes as required for application.

b) Tie Wire: ASTM A641; 18 gage galvanized annealed steel.

2. Screeds:
   a) General: ASTM C1047, size for plaster thicknesses shown manufactured by Stockton Wire Products, Inc.; galvanized steel or zinc alloy for exterior use.
   b) Comparable products manufactured by California Expanded Metal Co., or approved equal.
   c) Casing Beads: Casing Plaster Bead or Short Flange Casing, as shown; with solid flange.
   d) Expansion Screeds:
      1) General: Double V Groove.
      2) Corner Reinforcement: Woven or welded galvanized wire or expanded galvanized metal.
   e) Drip Mold: No. 2 Drip.

B. MIXES:
1. General: Per manufacturer's directions and CBC; mix only as much plaster as can be used prior to initial set. Combine materials dry, to uniform color and consistency, before adding water. Do not retemper mixes after initial set has occurred.
2. Synthetic Cement Plaster:
   a. General: Per manufacturer's instructions.
   b. Finish Coat: Per manufacturer's instructions.

3. EXECUTION:

A. PREPARATION:
1. Environmental Requirements: Maintain minimum temperature of materials, substrate and ambient air temperature above 50 degrees F during application and for at least 48 hours after each coat is applied. Do not apply when temperature exceeds 80 degrees F, or during wet or windy weather conditions.
2. Examination: Examine conditions of work in place before beginning work; report defects.
3. Measurements: Take field measurements; report variance between plan and field dimensions.
4. Protection: Protect mixtures from freezing, frost, contamination and evaporation. During installation protect adjacent surfaces from splattering of plaster.
5. Surface Preparation: Clean surfaces to receive plaster; remove loose materials and deleterious substances which may impair work.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Rated Assemblies: Per UL and code requirements; one manufacturer for each assembly,
3. Backing Paper:
   a. General: Apply two (2) layers of water vapor permeable (WVP) backing paper over substrate, lap edges 2 inches minimum. Fasteners/penetrations not allowed at sloped portions of wall offsets.
   b. Self-Sealing Underlayment: Apply at horizontal surfaces, surfaces up to 30 degrees from horizontal plane, and where shown; refer to Section 07 60 00 - FLASHING AND SHEET METAL.
4. Lath Application:
   a. General: Apply per ASTM C1063 taut, with long dimension perpendicular to supports. Lap ends minimum 1 inch; secure with tie wire where laps occur between supports. Lap sides minimum 1-1/2 inches.
   b. Lath Attachment:
      1. Metal Supports: Attach metal lath using screws and tie wire at maximum 6 inches on center.
      2. Concrete Supports: Attach metal lath with wire hair pins, hooks, or loops at maximum 24 inches on center.
   c. Lathing Accessories:
      1. General: Provide backing for proper attachment of lathing accessories; at butt joints connect with "Connector Clips" and set in bed of sealant.
      2. Grounds and Casing Beads: Apply in long lengths; straight, plumb and true; wherever plaster adjoins other materials, and around openings, including electrical boxes. Secure with wire ties at 7 inches on center.
      3. Expansion Screeds: Install at double studs and/or solid backing, in closed position, as recommended by manufacturer.
      4. Penetration Collars: Install at penetrating elements; seal penetrating element with caulking per 07 92 10 - JOINT SEALERS.
   d. Exterior Soffits: Per CBC, Section 2506A and as specified.
5. Bonding Agent: Apply where indicated per manufacturer's recommendations.
6. Primer: Apply per manufacturer's instructions.

7. Reinforcement: Apply where shown.
8. Plaster Application:
   a. General: Finish surfaces smooth and even, to within tolerance of 1/8 inch in 10'-0" per manufacturer's instructions.
   b. Application Method: By hand or machine; limit machine application to base coats.
   c. Plaster Thicknesses: As shown; measured from plaster base face to finished plaster surface.
   d. Finish Coat: Apply product specified to surface indicated, per manufacturer's directions.
9. Curing: As recommended by manufacturer based on environmental conditions at time of cure.

C. FIELD QUALITY CONTROL: Work containing cracks, blisters, pits, checks, and discoloration will not be accepted. Remove and replace with new work; defective work may be patched when permitted; patch to match existing work.

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GYPSUM BOARD Section 09 29 00

1. GENERAL:

A. SUMMARY: Provide Gypsum Board, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM):
      a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
      b. ASTM C11: Terminology Relating to Gypsum and Related Building Materials and Systems.
      c. ASTM C840: Specification for Application of Gypsum Board.
   2. Gypsum Association (GA):
      a. GA-214: Recommended Levels of Gypsum Board Finish.
      b. GA-216: Recommended Specifications for the Application and Finishing of Gypsum Board.
      c. GA-600: Fire Resistance Design Manual.
   3. Intertek Testing Services (ITS): Certification Listings.
   4. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of two (2) years from date of final acceptance by Owner.
D. QUALITY ASSURANCE:
   1. Fire Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated per ASTM E119 by an independent testing laboratory and acceptable to the jurisdictional authorities.
   2. Sound (STC) Rated Assemblies:
      a. General: Provide gypsum board assemblies with STC ratings shown; provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by a qualified independent testing agency.
      b. STC-Rated Assemblies: Design designations from GA-600 Section III - Sound Control.
   3. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory.
   2. Manufacture:
      a. General: Products manufactured by the Gold Bond Building Products Division of the National Gypsum Corp., unless otherwise indicated.
      b. Alternate Manufacturers: Comparable products manufactured by the United States Gypsum Co., or approved equal.
   3. Gypsum Wallboard:
      a. General: Gold Bond Gypsum Wallboard conforming to ASTM C1396; tapered edge where joint finish is required; 5/8 inch thickness, unless otherwise shown.
      b. Surface Paper: 100% recycled content paper on front, back and long edges.
      c. Fire-resistant: Gold Bond Gypsum Fire-Shield "Type X" fire-rated, with UL label; use throughout unless otherwise shown.
      d. Moisture and Mold Resistant: e2XP Extended Exposure Interior Extreme conforming to ASTM C1658 and applicable sections of ASTM C1396.
      e. Impact Resistant: Hi-Impact XP Wallboard.
   4. Resilient Furring Channels: RC-1.
   5. Acoustical Insulation:
      a. General: Refer to Section 07 21 00 - THERMAL INSULATION.
      b. Acoustic Sealer Pads: As recommended by insulation manufacturer.
   6. Corner Beads and Casing: Manufacturer's standard galvanized steel at exterior corners and L-shaped casing without back flange.
   7. Joint System Materials:
      a. General: ASTM C475.
      b. Tape: ProForm Paper Joint Tape.
      c. Joint Compound: ProForm All Purpose Ready Mix Joint Compound.
      d. Joint Finishing Compound: ProForm Ready Mix Topping Joint Compound.

e. Texture: As recommended by manufacturer for type of use and level of finish specified.

8. Fasteners:
   a. Screws:
      1. General: ASTM C954, Type W drywall screws; provide a minimum of ¾ inch penetration into wood framing.
      2. Metal Studs and Furring Channels: ASTM C1002, phillips, flat head, recessed, bugle shaped, self drilling, self tapping, rust inhibitive coated steel screws.
   b. Nails:
      1. General: ASTM C514; phosphate etched, concave head, steel wire nails, specially made for attachment of gypsum board.
      2. ½ Inch Board: 1-3/8 inches long, 14 gage.
      3. 5/8 Inch Board: 1-7/8 inches long, 13 gage.
      4. Double Layer ½ Inch Board: 2-1/4 inches long, 12 gage.
   c. Fasteners to Impact Resistant Wallboard: As recommended by manufacturer.
9. Interior Wall Sealant:
   a. General: Acoustical Sealant as manufactured by the Sealant/Weatherproofing Division, Tremco, Inc.
   b. Alternate Manufacturers: Comparable products manufactured by the Pecora Corp., or approved equal.

3. EXECUTION:

A. PREPARATION:
   1. Scheduling: Where gypsum wallboard and sprayed fireproofing are to be installed in the same area, install attachment clips for wallboard to metal framing before application of fireproofing.
   2. Environmental Requirements: Do not install wallboard or joint compounds if building temperature is below 55 degrees F. Provide proper ventilation to eliminate excessive moisture from building.
   3. Examination:
      a. General: Examine conditions of work in place before beginning work; report defects.
      b. Framing: Verify accurate spacing and alignment.
   4. Measurements: Take field measurements; report variance between plan and field dimensions.
   5. Delivery: Stack wallboard flat, off the ground, properly supported and protected from weather; use protective covering.
   6. Protection: Protect edges and surfaces from construction damage and soiling.

B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Fire Rated Assemblies: Per UL and applicable code requirements. Use only one manufacturer's products in the fabrication of each assembly, unless otherwise permitted by code.
   3. Acoustical Requirements:
      a. General: Refer to Section 07 21 00 - THERMAL INSULATION.
      b. STC-Rated Assemblies: Seal assembly at both faces of partitions at perimeter and through penetrations, and behind control and expansion joints with a continuous bead of acoustical sealant. Comply with ASTM C919 and manufacturer's recommendations for locating edge trim and closing off potential sound paths around or through assemblies, including sealing partitions above acoustical ceilings.
      c. Acoustic Sealer Pads: Install over backs and sides of electrical junction boxes and at wall penetrations where acoustical insulation is shown.
      d. Cut Outs and Penetrations:
         1. General:Cut-outs are to be regular and not fracture core or tear covering of gypsum board and meet the following requirements.
         2. Minimize penetrations of insulated wall and ceiling constructions. Penetrate only where necessary and fully seal airtight at the perimeter using acoustical sealant.
         3. Where ducts and piping greater than 3-inches diameter penetrate insulated wall or ceiling construction, provide a clearance of 1-inch + 1/4-inch at the perimeter of the penetration.
         4. Where conduit piping 3-inches diameter and less (including mechanical, hydraulic, plumbing, etc.) pass through insulated wall or ceiling construction, provide a clearance of 1/4-inch + 1/8-inch between the conduit or piping and the structure, unless otherwise shown.
         5. After the ductwork, conduit or piping has been installed, repair the gypsum board perimeter clearance to the specified tolerance as required. Where the clearance exceeds 3/4-inch, provide a sheet metal sleeve within the partition packed with safing insulation batts and caulk both sides airtight with an acoustical sealant. Where the perimeter clearance exceeds 3/8-inch, use a flexible backing rod to caulk against.
         6. Where penetration clearances are 3/8-inch or less, caulk airtight with acoustical sealant at gypsum board.

7. Gypsum board penetrations (including those resulting from wiring, cables, and electrical junction boxes) are to be sealed airtight with acoustical sealant.

4. Gypsum Wallboard:
   a. Sheet Arrangement Layout: Install as shown; use long sheets to restrict joints to minimum.
   b. Cutting and Scribing:
      1. General: Cut neatly to fit around outlets, switch boxes and other protrusions.
      2. Moisture Resistant Gypsum Board: Treat cut edges and holes with sealant.
   c. Joints: Butt sheets loosely together with tapered edges placed together; butt edges placed next to tapered edges are not acceptable. Sand or kerf cut edges and mill ends to provide smooth jointing on exposed face. Stagger end joints. Shim wallboard as required to provide even joints, without offsets.
   d. Fasteners:
      1. General: Place not less than 3/8 inch from edges of board, with heads dimpled slightly below surface; do not cut through paper.
      2. Ceilings, Non-rated: Screws, 12 inches on center.
      3. Walls, Non-rated: Screws, 12 inches on center.
      4. Ceilings, One-hour Rated: As shown.
      5. Walls, One-hour Rated: As shown.
   e. Trim: Place control joints consistent with lines of building; corner beads at exterior corners; and casing beads where wallboard abuts other materials, and as shown.
   f. Interior Wall Sealant: Install double bead of sealant at floor, wall intersections, where walls abut other materials, electrical boxes and any other penetrations of interior partitions.
   g. Partitions:
      1. General: Place boards with long dimensions either vertical or horizontal on studs; stagger vertical joints on opposite sides of partitions; keep end joints to minimum. Locate joints a minimum of 12 inches from jambs of openings.
      2. Deflection: Where gypsum board is carried full height of wall to the structure above, undercut the board by 3/8 inch and seal the top edge of the board to structure with continuous bead of sealant.
   h. Ceilings:
      1. General: Install boards with long dimension at right angles to supports; end joints, perimeter of ceiling and edge of openings over solid bearing members.
      2. One (1) Hour:
         a) General: As shown.
         b) Fixture Enclosures: 5/8 inch thick UL labeled wallboard around fixtures.

5. Finishing:
   a. General: Finish joints, fastener depressions, applied metal trim and surface blemishes per manufacturer's directions.
   b. Finished Wallboard: Sand as necessary to provide flat, smooth surface ready for decoration.
   c. Concealed Wallboard: Wallboard covered by panels or wall-fastened casework, and wallboard above level of finished ceiling, does need to be sanded smooth.
   d. Surface Finishes:
      1. General: Finish gypsum board in compliance with GA 214 requirements. Apply Level 4 - Smooth finish, unless otherwise noted.
      2. Food Preparation Spaces, Toilet and Janitor Rooms: Level 5 - Smooth finish.
   e. Tolerances:
      1. General: Refer to Section 01 43 00 - QUALITY ASSURANCE.
      2. Maximum Variation: 1/8 inch in 10'-0" in any direction.

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TILING Section 09 30 00

1. GENERAL:

A. SUMMARY: Provide Tiling, as shown and specified per Contract Documents.

B. REFERENCES:
1. American National Standards Institute (ANSI): ANSI/TCNA A108.1B - Installation of Ceramic Tile with Portland Cement Mortar.
2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
3. International Association of Plumbing and Mechanical Officials (IAPMO): Waterproof membrane certification.
4. Portland Cement Association (PCA): Portland Cement Plaster/Stucco Manual.
5. Tile Council of North America (TCNA): Handbook for Ceramic Tile Installation.
6. Steel Stud Manufacturers Association (SSMA): Product Technical Information - Specifications for lathing and furring.

C. SUBMITTALS:
1. General: Submit product data.
2. Samples:
   a. Ceramic Tile: Submit each type, class and color.
   b. Grout: Submit manufacturer's standard colors.
3. Certificates: Submit Master Grade Certificate per ANSI/TCA A137.1, from tile manufacturer for each type of tile installed.
4. Closeout: Submit maintenance data and guarantee in required form for a period of two (2) years from date of final acceptance by Owner.
5. Extra Stock: Deliver one (1) percent or a minimum of one full container of each kind and type of tile installed.

D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
1. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS- 36.
2. Ceramic Tile:
   a. General: Specified products are manufactured by Dal-Tile International, unless otherwise indicated.
   b. Alternate Manufacturers: Comparable products manufactured by the Crossville Ceramics, Inc., or approved equal.
   c. Manufacture: Conform to ANSI A137.1.
   d. Interior Tile:
      1. Type 1 - Unglazed Wall, Floor, Base, and Trim (CT-1):
         a) General: Keystones Standard Grade, unglazed mosaic tile; cushion edges, satin matte finish; standard color as selected by the City Representative.
         b) Trim Units: Matching trim and other shapes as required.
         c) Shapes and Sizes: Flat; 1 inch x 1 inch x 1/4 inch.
         [d) Coefficient of Friction: ASTM C1028 0.60 at floors; 0.80 at ramps.
         e) Mounting: Dot type adhesive.
      2. Type 2 - Quarry Tile, Bullnose Base and Wainscot (CTW and CTB):
         a) General: Quarry Tile slip resistant, hard burned shale with square edges and grooved backs for mortar setting; standard color as selected by the City Representative.
         b) Coefficient of Friction: ASTM C1028; minimum of 0.60, 0.80 at ramps.
         c) Trim Units: Matching trim and other shapes as required.
         d) Shapes and Sizes: Flat; 6 inch x 6 inch x 1/2 inch.
      3. Type 3 - Specialty Wall Tile (CT):
         a) General: Subway Series manufactured by Arizona Tile.
         b) Alternate Manufacturers: Comparable products manufactured by Dal-Tile International, or approved equal.
         c) Shapes and Sizes: Flat; 3 inch x 6 inch x 1/4 inch.
3. Setting Bed:
   a. General: Specified products are manufactured by the United States Gypsum Co.

b. Alternate Manufacturers: Comparable products manufactured by the Gold Bond Building Products Division of the National Gypsum Corp., or approved equal.
c. Lath:
1. General: ASTM C847, flat diamond, 2.5 lbs. per square yard.
2. Expanded Metal Lath: Conform to CBC Chapter 25 for lath types, weights, attachments and support spacing, except where otherwise noted.
d. Lathing Accessories:
1. Fasteners:
a) Nails: Common wire, galvanized 12 gage, diamond point, 1-1/2 inches long.
b) Screws: ASTM C954, Type W; provide a minimum of ¾ inch penetration into wood framing.
c) Hook Staples: 1/2 inch wide x 1-1/2 inches long, No. 9 gage ring shank, hook staple.
d) Tie Wire: 18 gage galvanized annealed steel.
2. Screeds: ASTM C1047, galvanized steel.
e. Cement Plaster:
1. Cement: ASTM C150, Type I, Portland.
2. Lime: ASTM C207, Type S.
3. Aggregate: Sand per ASTM C897.
4. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.

4. Grout Joint Filler:
a. General: Prism Surecolor Grout manufactured by Custom Building Products, color selected by the City Representative.
b. Alternate Manufacturers: Comparable products manufactured by Super Stone, Inc., or approved equal.
5. Sealants: As specified in Section 07 92 10 - JOINT SEALERS.
6. Curing Paper: FS UU-P-790, Type II, Grade E, Style 8.

B. MIXES:
1. General: Per ASTM C926; mix only as much plaster as can be used prior to initial set. Protect mixtures from freezing, frost, contamination, and evaporation. Do not retemper mixes after initial set has occurred.
2. Cement Plaster Mortar: Comply with requirements of referenced standards, including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars of uniform quality with optimum performance characteristics for application shown.
3. Grout Joint Filler: Per manufacturer's recommendations.

3. EXECUTION:

A. PREPARATION:
1. Scheduling: Do not apply floor tile in space requiring wall tile until wall tile setting is complete.
2. Environmental Requirements: Maintain minimum temperature of materials, substrate and ambient air temperature above 50 degrees F during application and for at least 48 hours after each coat is applied. Do not apply when temperature exceeds 80 degrees F, or during wet or windy weather conditions.
3. Examination: Examine conditions of work in place before beginning work; report defects.
4. Measurements: Take field measurements; report variance between plan and field dimensions.
5. Protection: Protect adjacent surfaces from splattering of plaster during installation and from damage during subsequent construction. Remove cracked, broken, and damaged tiles; replace with new.
6. Surface Preparation:
a. General: Verify that surfaces to receive tile are completely clean and free of material that might affect the adhesion of either grout bed set or adhesive applied tile.
b. Moisture Testing: Per ASTM F1869; proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lbs. of water per 1000 square feet in 24 hours.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Workmanship:
a. General: Comply with TCNA "Handbook for Ceramic Tile Installation", for applicable substrate conditions.
b. Mortar Bed:
1. General: TCNA F112 and ANSI/TCNA A108.1.
2. Wall Tile: TCNA W231 and ANSI/TCNA A108.01.
3. Exterior: Flush with surrounding materials, as shown.
c. Joints for Vertical and Horizontal Tile Surfaces: TCNA EJ171.

d. Grout: ANSI 108.10.

3. Cutting:
   a. General: Do not use cut tile smaller than half size; use cut tile on outer edges of field only.
   b. Smoothing: Level cut edges with carborundum stone; install no tile with jagged or flake edges.
   c. Splitting: Expressly prohibited except where no alternative is possible.
4. Wall Tile:
   a. General: Apply tile to firm, level, plumb, and square surfaces. Lay tile with minimum number of cut tiles; tiles less than one-half size in either face not permitted.
   b. Corners: Round outside; square inside.
   c. Joints: Align with floor tile; 1/4 inch wide.
   d. Setting Method:
      1. General: Install per ANSI/TCNA 108.1 and as specified. Provide where shown.
      2. Thickness; Setting Bed Mortar: Including scratch coat; 3/4 inch thick minimum.
   e. Penetrations: Fit tile closely around penetrations and where edges will be covered by trim, escutcheons or other similar devices.
   f. Sealant: Fill joints between wall tile and plumbing and other built-in fixtures with silicone rubber sealant of color to match tile.
5. Bench Tile:
   a. General: Center field work in both directions to permit laying pattern with a minimum of cut tiles. Lay tile from center lines outward; make adjustments at walls. Tiles less than one-half size in either face not permitted. Slope to floor drains as required.
   b. Corners: Round outside; square inside.
   c. Joints: Align with wall tile; 1/4 inch wide.
   d. Setting Method: Install per ANSI/TCNA 108.1 and as specified. Provide where shown.
6. Grouting: Grout joints full; make smooth and flush; remove excess.
7. Sealant: Fill joints between floor tile and plumbing and other built-in fixtures with urethane or polysulfide sealant of color to match tile.
8. Allowable Tolerances:
   a. General: Refer to Section 01 43 00 - QUALITY ASSURANCE.
   b. Setting Bed Method:
      1. General: Maximum deviations from level and plumb, and from elevations, locations, slopes, and alignments shown.
      2. Bench: Any direction, 1/8 inch in 10'-0"; 1/32 inch offset.
      3. Walls: Any direction, 1/8 inch in 8'-0"; 1/32 inch offset.
9. Curing:
   a. General: Per referenced standards; keep damp for at least 72 hours.
   b. Horizontal Surfaces: Cover areas with curing paper.

C. CLEANING: Upon completion clean per ANSI 108.1 and 108.4.

* * *

RESILIENT FLOORING Section 09 65 00

1. GENERAL:

A. SUMMARY:
1. General: Provide Resilient Flooring, as shown and specified per Contract Documents.

B. REFERENCES:
1. American National Standards Institute (ANSI): ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People.
2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.

C. SUBMITTALS:
1. General: Submit product data.
2. Samples:
   a. General: Submit manufacturer's standard colors.
   b. Metal Edge Strips: Submit specified finish.
3. Closeout: Submit maintenance data, extra stock and guarantee in required form for a period of two (2) years from date of final acceptance by Owner.

D. QUALITY ASSURANCE:
1. Qualifications:
   a. General: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
   b. Sheet Vinyl: Installer manufacturer trained and approved.

2. PRODUCTS:

A. MATERIALS:
1. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS- 36.
2. Resilient Flooring:
   a. General: Marmoleum Collection manufactured by Forbo Linoleum Co., Inc.; unless otherwise indicated.
   b. Alternate Manufacturers: Comparable products manufactured by Azrock Division, Domco Tarkett Commercial, or approved equal.
   c. Linoleum:
      1. Tile: Marmoleum Graphic 5311 Signo; provide in colors as shown.
      2. Sheet:
         a) General: Marmolieum Graphic; color as selected by the City Representative.
         b) Bulletin Board: No. 2202 Forbo Bulletin Board; color as selected by the City Representative. Provide custom sizes and edging as shown.
         c) Desktops: Forbo Desktop; color as selected by the City Representative
3. Athletic Flooring:
   a. General: Mega-Tile XL manufactured by AMARCO (American Mat and rubber Co.)
   b. Alternate Manufacturers: Comparable products manufactured by Encore International, or approved equal.
   c. Thickness: 1 inch.
4. Resilient Base:
   a. General: 700 Series wall base manufactured by the Roppe Corp.; color as selected by the City Representative.
   b. Alternate Manufacturers: Comparable products manufactured by Johnsonite, Inc., or approved equal.
5. Edging Strips:
   a. General: Transitional Mouldings manufactured by the Burke/Mercer Flooring Products Division of Burke Industries, Inc.; color as selected by the City Representative.
   b. Alternate Manufacturers: Comparable products manufactured by Johnsonite, Inc., or approved equal.
   c. Resilient Flooring to Concrete: Model No. 170.
   d. Top-set Stair Nosing: Model No. 510.
6. Adhesives: Moisture and alkali resistant, as recommended by flooring manufacturer.
7. Patching and Leveling Compounds: As recommended by manufacturer.
8. Wax: ASTM D4078, 16 percent concentration; slip-resistant, water emulsion base.

3. EXECUTION:

A. PREPARATION:
1. Scheduling: Do not lay flooring until other work that might cause damage to flooring is complete.
2. Environmental Requirements:
   a. General: Minimum temperature of building and materials maintained at 65 degrees F for 24 hours prior to and during installation, and until adhesives have cured.
   b. Moisture: Do not apply materials on wet or damp surfaces.
3. Examination:
   a. General: Examine conditions of work in place before beginning work; report defects.
   b. Concrete Subfloors: Verify that slabs comply with ASTM F710. No extra payment for work additional to that shown and/or specified, for complete application of resilient flooring, will be allowed if such additional work is apparent from inspection of existing premises and conditions.
4. Measurements: Take field measurements; report variance between plan and field dimensions.
5. Surface Preparation:
   a. General: Clean subfloors; patch and level cracks, holes, depressions and other imperfections per manufacturer's directions.
   b. Moisture Testing: Per ASTM F1869; proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lbs. of water per1000 square feet in 24 hours.
   c. Existing Subsurfaces: Prepare existing subfloors as required to receive resilient flooring; remove existing flooring and adhesive.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Tolerances: Refer to Section 01 43 00 - QUALITY ASSURANCE.
3. Adhesive Application: Per adhesive manufacturer's directions; do not exceed working area or time limits stated by manufacturer.
4. Sheet Linoleum: Install with minimum number of tight, hairline seams. Loose floor covering, open seams, voids under covering, raising and puckering at joints or seams, or telegraphing of adhesive spreader marks through floor covering is not acceptable. Seamless installation is required when roll width is sufficient to cover the width of room.
5. Linoleum Tile:
   a. General: Install wall to wall and to fixed cabinets and casework and under freestanding equipment; cut neatly to and around permanent fixtures.
   b. Layout: Lay from centerline, square and parallel, with straight unbroken joint lines; install partial tiles of equal width at opposite sides of room, as required; less than half-tile width not acceptable.
   c. Pattern: Alternate direction of tile pattern for each abutting tile in line. Fit tightly and accurately to vertical surface with clean cuts.
   d. Bulletin Board: Install per manufacturers instructions; provide custom sizes and edging as shown.
   e. Desktops: Install where shown.
6. Athletic Flooring: Install per manufacturers instructions, as shown.
7. Resilient Base:
   a. General: Install on surfaces as scheduled, including cabinet bases and other equipment. Provide cove base typically, carpet base at carpeted floors.
   2. Application: Set straight and level, joints closely fitted and flush; top and bottom edges in firm, full contact with floor and back bonded to wall. At masonry, v-joints in concrete, or similar irregular surfaces, fill voids at top edge of base with adhesive filler material as recommended by base manufacturer. Protect adjacent surfaces from adhesive staining.
8. Edging Strips: Provide at transitions of floor covering material.

* * *

ACOUSTIC BOARD INSULATION Section 09 81 13

1. GENERAL:

A. SUMMARY: Provide Acoustic Insulation Board, as shown and specified per Contract Documents.

B. REFERENCES:
   1. The Engineered Wood Association (APA): APA AFG-01 – Specification for field gluing subfloors.
   2. American Society for Testing and Materials (ASTM):
      a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
      b. ASTM C209: Test Methods for Cellulosic Fiber Insulating Board.
      c. ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
      d. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials
   3. Forest Stewardship Council (FSC): CoC Certification No. 5682.
   4. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.

C. SUBMITTALS:
   1. General: Submit product data.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. LEED Certification Requirements:
      a. General: Use only Forest Stewardship Council (FSC) certified wood products from acceptable FSC sources with Chain of Custody (CoC) documentation and number.
      b. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory.
   2. Acoustic Insulation Board:
      a. General: 440 SoundBarrier manufactured by the Homasote Co.
      b. Alternate Manufacturers: Comparable products manufactured by Blue Ridge Fiberboard, Inc., or approved equal.
      c. Thickness: As shown.
      d. Noise reduction coefficient (NRC): 0.20.
      e. Flame Spread: 76 to 200 tested per ASTM E84, Class III or C.
   3. Adhesive: As recommended by the manufacturer for type installation shown.
   4. Fasteners: As recommended by manufacturer.
   5. Sealant: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
   3. Protection: Store products in manufacturer's unopened packaging with labels intact, in a dry place, indoors, on raised platform protected from weather damage until ready for installation.

B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

* * *

PAINTING Section 09 91 00

1. GENERAL:

A. SUMMARY:
1. General: Provide Painting, as shown and specified per Contract Documents.

B. REFERENCES:
1. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section.
   b. ASTM D16: for interpretation of terms used in this Section.
2. Master Painters Institute (MPI): Painting Manuals.
3. National Paint and Coatings Association (NPCA): Guide to U.S. Government Paint Specifications.
4. Painting and Decorating Contractors of America (PDCA): Painting - Architectural Specifications Manual.
5. Steel Structures Painting Council (SSPC): Steel Structures Painting Manual.

C. SUBMITTALS:
1. General: Submit product data and a certificate stating compliance with federal, state and local VOC regulations.
2. Samples:
   a. General: Submit manufacturer's standard colors for each surface finishing product specified. Submittals shall be reviewed and approved by City paint shop or facilities staffs before materials are ordered.
   b. Field Samples:
      1. General: In place, on material scheduled to be finished, illustrating coating color, texture and finish. Locate where directed; accepted sample may remain as part of the Work.
      2. Size: 8'-0" x 8'-0" panel, or one (1) entire unit as scheduled to be finished.
3. Closeout:
   a. General: Submit maintenance data.
   b. Extra Stock: Deliver one percent (1%) or a minimum of one (1) gallon of each color, type and surface texture of paint installed. Label each container with color, type, texture and room locations.
   c. Guarantee:
      1. General: Provide in required form for a period of one (1) year from date of final acceptance by Owner.
      2. Criteria: Color and finish appearance shall remain unchanged throughout entire guarantee period.

D. QUALITY ASSURANCE:
1. Applicator: Specializing in performing the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
2. Volatile Organic Compounds (VOC): Use only products in compliance with VOC content limits required by state and local jurisdictional regulations.

2. PRODUCTS:

A. MATERIALS:
1. VOC Materials Compliance:
   a. General: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and the following:
   b. Paints and Coatings: Green Seal Standard GS-11.
   c. Recycled Content Latex Paint: Green Seal Standard GS-43.
   d. Stains and Finishes: Green Seal Standard GS-47.
2. Manufacture:
   a. General: Specified products are premium grade products of the Frazee Paint Co., unless otherwise indicated.
   b. Alternate Manufacturers: Comparable products manufactured by the Dunn Edwards Corp., or approved equal.
   c. Container Label: Identify with manufacturer's name, and include description of type of paint, brand name, lot number, brand code and color designation.
3. Paint Materials:
   a. General: Provide manufacturer's standard ready mixed products, except field catalyzed coatings. Provide accessory materials such as linseed oil, shellac, thinners, cleaners and other materials not specifically indicated but required to achieve finishes specified.

b. Patching Material: Latex type as recommended by manufacturer.
c. Primer:
1. Concrete Block (Filler): UltraTech C302.
2. Metal (Acrylic): UltraTech C305.
3. Metal (Water-based): UltraTech C309.
4. Metal (Galvanized): No. 6750424 Low VOC Gray Shop Primer.
5. Metal (Zinc Chromate): No. 6750426 Low VOC Red Oxide.
6. Wood: UltraTech C312.
7. Exterior:
a) Concrete & Masonry Sealer (Epoxy): UltraTech C251.
b) Wood (Semi-transparent Stain):
8. Interior:
a) Wall (Latex): UltraTech C153.
b) Wood (Stain): UltraTech C365.
9. Varnish:
(a) General: Semi-gloss Helmsman Spar Urethane manufactured by Minwax.
(b) Alternate Manufacturers: Comparable (Varathane Premium Spar Urethane) products manufactured by Rust-Oleum Brands, or approved equal.
d. Paints:
1. Exterior:
a) Housepaint, Flat: UltraTech C225.
b) Housepaint, Semi-Gloss: UltraTech C229.
c) Elastomeric Paint: No. 216 EMC Elasto-wall (Smooth).
d) Lime Wash Paint:
1) General: Lime Wash Paint manufactured by Portola Paints and Glazes.
2) Alternate Manufacturers: No known equal.
3) Primer: Manufacturers standard.
2. Interior:
a) Wallpaint, Flat: UltraTech 129.
b) Wallpaint, Semi-gloss: UltraTech 136.
c) Enamel, Semi-gloss (Acrylic): UltraTech C126.
e. Epoxy Coatings: Product No. 1W - 100% Solids Hi-Build Epoxy Coating manufactured by Epoxy Systems, Inc., or approved equal.

B. MIXING:
1. General: Mix paints at the factory; do not alter or reduce materials except as directed by manufacturer.
2. Colors: As selected by City Representative from manufacturer's full range of submitted samples; factory mix match. No tinting of finish coats will be allowed at job site unless specifically approved by City Representative.
3. Mildew Resistance: Add fungicidal agent to paint per manufacturer's recommendations; approximately 4 oz. per gallon. Add agent at the factory; clearly indicate on label that paint is mildew resistant.

3. EXECUTION:

A. PREPARATION:
1. Environmental Requirements:
a. General: Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the manufacturer.
b. Temperature:
1. General: Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the manufacturer.
2. Exterior Paints: 50 degrees F minimum during and for 48 hours after application; do not apply when temperature is over 85 degrees F, except in protected or shaded areas.
3. Interior Paints: 65 degrees F for minimum of 48 hours before, during and for 48 hours after application.
c. Ventilation: Provide adequate ventilation of all interior spaces during application and curing of all painting products.
d. Lighting Level: Provide minimum 80 foot candles measured at mid-height of room.
2. Examination:
a. General: Examine conditions of surfaces in place before beginning work; report defects.
b. Shop Applied Primer: Test for compatibility with subsequent cover materials.
c. Moisture Content:
1. General: Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
2. Plaster and Gypsum Wallboard: 12 percent.

3. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
4. Wood: 15 percent, measured in accordance with ASTM D2016.
5. Concrete Floors: 8 percent.

d. Acceptance:
1. General: Application of first coat of painting process constitutes acceptance of surface.
2. Gypsum Board: Inspect after application of seal coat; application of subsequent coat of painting process constitutes acceptance of surface.

3. Storage:
a. General: Store in properly ventilated separate structure not less than 50'-0" from any other structure on the site.
b. Temperature: Maintain minimum of 45 degrees F and a maximum of 90 degrees F.
c. Fire Prevention: Take necessary precautions to prevent fire; remove paint-soiled rags and waste from building each day or store in metal containers with covers in the paint storage structure.

4. Protection: Protect adjacent surfaces not scheduled for paint finish from damage resulting from painting operations.

5. Surface Preparation:
a. General: Clean surfaces free of dust, grease, wax, oil, rust and other foreign matter. Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing. Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit loose surface conditions. Use Shellac to seal marks which may bleed through surface finishes.
b. Impervious Surfaces: Remove mildew by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow surface to dry.
c. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify that required acid-alkali balance has been achieved. Allow to dry.
d. Gypsum Board Surfaces: Fill minor defects with filler compound; spot prime defects after repair.
e. Galvanized Surfaces: Remove surface contamination and oils; wash with solvent. Apply coat of etching primer.
f. Concrete and Unit Masonry: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter at surfaces scheduled to receive paint finish. Remove oil and grease with a solution of trisodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
g. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
h. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand/power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
i. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Verify compatibility of specified primer and paint with shop applied primer.
j. Exterior Wood:
1. Opaque Finish: Remove dust, grit, and foreign matter. Scrape, rough edge, seal knots, pitch streaks and sappy sections, and sand. Fill nail holes with tinted exterior calking compound after prime coat has been applied.
2. Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied at surfaces to be painted only.
k. Interior Wood:
1. Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
2. Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.
l. Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

6. Existing Fixtures: Remove or mask existing building detail accessories not to be painted such as building signage, outlet and switch plates, HVAC grilles, etc.; reinstall at completion of painting operations.

B. APPLICATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

2. Performance:
   a. General: Apply each coat to uniform finish, slightly darker than preceding coat unless otherwise approved. Sand wood and metal lightly between coats to achieve required finish. Vacuum clean surfaces free of loose particles; use tack cloth just prior to applying next coat. Allow applied coat to dry before next coat is applied.
   b. Clear Finishes: Where required, tint fillers to match wood; work fillers into the grain before set and wipe excess from surface.
   c. Woodwork: Prime concealed surfaces of woodwork; where scheduled to receive stain or varnish, finish with gloss varnish reduced 25 percent with mineral spirits.
3. Finishing Mechanical and Electrical Equipment: Refer to Division 21 - FIRE SUPPRESSION; 22 - PLUMBING; 23 - HEATING, VENTILATING AND AIR CONDITIONING; 26 - ELECTRICAL for schedule of color coding and identification banding of equipment, duct work, piping, and conduit. Paint shop-primed equipment. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are pre-finished. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint. Paint dampers exposed behind louvers and grilles to match face panels. Paint exposed conduit and electrical equipment occurring in finished areas. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
4. Exterior Surfaces:
   a. Wood; Painted: One (1) coat primer sealer; two (2) coats enamel, semi-gloss.
   b. Wood; Transparent: Two (2) coats stain; two (2) coats varnish, semi-gloss.
   c. Concrete, Concrete Block: One (1) coat of block primer; two (2) coats, semi gloss.
   d. Cement Plaster: One (1) coat primer sealer; two (2) coats elastomeric.
5. Interior Surfaces:
   a. Wood; Painted: One (1) coat prime sealer; two (2) coats enamel, semi-gloss.
   b. Wood; Transparent: Two (2) coats stain; one (1) coat sealer; two (2) coats varnish, semi-gloss.
   c. Concrete, Concrete Block: One (1) coat of block filler; two (2) coats semi-gloss; 2 Coats epoxy wall coating in wet areas.
   d. Steel; Unprimed: One (1) coat primer; two (2) coats enamel, semi-gloss.
   e. Steel; Primed: Touch-up with primer; two (2) coats enamel, semi-gloss.
   f. Steel; Galvanized: One (1) coat primer (galvanized); two (2) coats of enamel, semi-gloss.
   g. Gypsum Board: One (1) coat of primer sealer; two (2) coats wallpaint, flat; 2 coats semi-gloss where shown.
   h. Insulated Coverings; Canvas and Cotton: One (1) coat primer sealer; two (2) coats enamel, semi-gloss.

C. CLEANING:
1. General: Upon completion, remove masking materials, reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing, and thoroughly clean all exposed surfaces per manufacturer's instructions. Keep premises free from accumulation of waste and rubbish. At the completion of work remove surplus materials, rubbish, and debris.
2. Touch-up: After detailed inspection of paint work, touch up or refinish abraded, stained or otherwise disfigured work, as required by the City Representative.
3. Cleaning: Remove containers, rags and debris from the site; observe special care in control or disposal of flammable materials.

* End Division 09 *

Division 10 - SPECIALTIES

VISUAL DISPLAY BOARDS Section 10 11 10

1. GENERAL:

A. SUMMARY: Provide Visual Display Boards, as shown and specified per Contract Documents.
B. REFERENCES:
   1. Aluminum Association (AA): Designation System for Aluminum Finishes.
   2. American National Standards Institute (ANSI): ANSI A135.4 - Basic Hardboard.
   3. Composite Panel Association (CPA): CPA A135.4 - Basic Hardboard.
   4. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   5. Porcelain Enamel Institute (PEI): Performance Specifications for Porcelain Enamel Chalkboards.
C. SUBMITTALS:
   1. General: Submit product data and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. Visual Display Boards:
      a. General: Manufactured by the Platinum Visual Systems, a Division of ABC School Systems, Inc.
      b. Alternate Manufacturers: Comparable products manufactured by the Claridge Products and Equipment Co., Inc., or approved equal.
      c. Frames:
         1. General: Standard Trim System; size and configuration as shown.
         2. Sliding: Manufacturer's standard 2 panel Wall Hung Horizontal Sliding unit; size and configuration as shown.
         3. Recycled Aluminum Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost) of the total value of the materials for the project.
      d. Marker Boards:
         1. Facing Sheet:
            a) General: ASTM A424; 28 gage; enameling grade steel.
            b) Writing Coat: Manufacturers standard, color selected by the City Representative.
         2. Core Materials: Manufacturer's standard.
      e. Accessories: Manufacturer's standard trough full length at writing boards.
   2. Mounting Adhesive: Manufacturer's standard.
   3. Fasteners: Tamper-proof type screws; manufacturer's standard.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Frames: Install plumb, level, straight, and true to line in plane of wall. Fit to precise hairline joints with no rough edges. Do not install until painting is complete.
   3. Accessories: Install as shown and specified.

* * *

SIGNAGE Section 10 14 00

1. GENERAL:

A. SUMMARY: Provide Signage, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. Americans with Disabilities Act (ADA):
      a. General: Americans with Disabilities Act of 1990, ADA - 42 U.S. Code Chapter 126.
      b. ADA Standards for Accessible Design: U.S. Department of Justice, 28 CFR Part 36.
   3. California Building Code (CBC): Sections 1115B.5 and 1117B.5.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data, extra stock and guarantee.

2. PRODUCTS:

A. MATERIALS:
   1. VOC Materials Compliance: Use only adhesives and sealants that do not exceed the VOC limit requirements of the California Environmental Protection Agency (CalEPA), State regulations and standards; local Air Quality Management Districts (AQMD) as identified in the California Air Resources Board Local Air District Directory; and Green Seal Standard GS- 36.
   2. Signage Requirements:
      a. General: Conform to the requirements of California Title 24 Accessibility Requirements and the Americans with Disabilities Act.
      b. Tactile Character Type: Tactile characters on signs shall be raised 1/32 inch minimum and shall be sans serif uppercase characters accompanied by Contracted Grade 2 Braille (see note below) CBC Section 1117B 5.5.1.
      c. Tactile Character Size: Raised characters shall be a minimum of 5/8 inch and a maximum of 2 inches. CBC Section 1117B.5.5.2.
      d. Finish and Contrast: Contrast between character, symbols and their background must be 70% minimum and have a non-glare finish. CBC Section 1117B.5.5.2.
      e. Proportions: Characters on signs shall have a width-to-height ratio of between 3:5 and 1:1 and a stroke width-to-height ratio of between 1:5 and 1:10. CBC Section 1117B.5.3. All letters measured must be uppercase. After choosing a type style to test, begin by printing the letter **I, X**, and **O** at 1 inch high. Place the template's 1:1 square over the **X**, or **O**, whichever is narrower. If the character is not wider than 1 inch, nor narrower than the 3:5 rectangle, the proportions are correct. Use the 1:5 rectangle to determine if the stroke of the **I**, is too broad, and the 1:10 rectangle to see if it is too narrow. If all the tests are passed, the type style is compliant with proportion requirement.
      f. Braille: California (Contracted) Grade 2 Braille shall be used wherever Braille is required in other portions of these standards. Dots shall be 1/10 inch (2 54 mm) on center in each cell with 2/10 inch space between cells, measured from the second column of dots in the first cell to the first column of dots in the second cell. Dots shall be raised a minimum of 1/40 inch above the background. Braille dots shall be domed or rounded. CBC Section 1117B 5 6
   3. Signs:
      a. General:
         1. Material: Aluminum sheet per ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
         2. Sign: 1/8 inch thick, unless otherwise noted, engraved and paint filled brushed aluminum, color as selected by City Representative; engraving 1/32 inch deep in black background color.
         3. Letters: Uppercase 3/4 inch high, minimum; style as selected by City Representative.
         4. Symbols: International style.
         5. Finish: Manufacturer's standard clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish.
      b. Room Identification: Per CBC 1117B.5.9.
      c. Toilet Room Door Signs:
         1. General: Per CBC Section 1115B.5; 1/4 inch thick with eased edges, with raised letters and braille, as shown. Background color to contrast with door color.
         2. Unisex Toilets: Superimposed 12 inch triangle on 12 inch circle, with word "Toilet" below.
         3. Side Mounted Signs: Per CBC Section 1115B.5 and 1117B.5.7.
      d. Entrance and Exit Signs:
         1. General: Per CBC Section 1117B.5; 9 inches high x 6 inches wide, 1/4 inch thick, with eased edges.

2. Entrance: International symbol of accessibility with the word "ENTRANCE" below symbol.
3. Exit: International symbol of accessibility with the word "EXIT" below symbol, and directional arrow pointing to required exit, where required.
4. Tactile Exit Signage: As shown.

4. Fasteners: As recommended by manufacturer; tamper-proof screws; anchors where required.
5. Adhesives: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
1. Environmental Requirements: Do not install signs when temperature is below 70 degrees F.
2. Examination: Examine conditions of work in place before beginning work; report defects.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified. Mounting location shall be determined so that a person may approach within 3 inches (76 mm) of signage without encountering protruding objects or standing within the swing of the door. CBC Section 1117 B 5 7.
2. Locations: As shown, or as directed by the City Representative.
3. Surface Mounted:
   a. Room Identification: As directed, per CBC 1117B.5.7.
   b. Toilet Room Signs: As directed, per CBC Section 1115.B.5 and 1117B.5.7.
   c. Entrance and Exit Signs:
      1. General: Per CBC Section 1117B.5.7.
      2. Entrance: Provide at each accessible entrance to the building.
      3. Exit: Provide at accessible exits where shown.
      4. Tactile Exit Signage: As shown.
4. Building Identification: Refer to Section 10 14 75 - BUILDING IDENTIFICATION.
5. Traffic Signage: Refer to Section 10 14 53 - TRAFFIC SIGNAGE
6. Exit Signs: As required; for illuminated exit signs refer to Division 26 - ELECTRICAL.

* * *

PLAQUES Section 10 14 16

1. GENERAL:

A. SUMMARY: Provide Plaques, as shown and specified per Contract Documents.
B. REFERENCES:
   1. Aluminum Association (AA): Finishing Standards.
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   3. Copper Development Association (CDA): Properties of Wrought and Cast Copper Alloys.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. Dedication Plaque:
      a. General: Cast Bronze Plaque manufactured by Metallic Arts, Inc.
      b. Alternate Manufacturers: Comparable products manufactured by A.R.K. Ramos Manufacturing Co., Inc.
      c. Material: Manufacturer's standard cast bronze.
      d. Dedication Plaque:
         1. Size: As shown 16 inches x 24 inches.
         2. Border: Plain bevel; polished face.
         3. Background: Matte surface; oxidized with a clear lacquer finish.
         4. Letters: Helvetica medium; polished face.
         5. City Seal: As shown.
         6. Layout: As shown.
      e. Mountings: Tamperproof; as recommended by the manufacturer for condition shown.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Mounting: Concealed mounting per manufacturer's directions.

* * *

SITE AND TRAFFIC SIGNAGE Section 10 14 53

1. GENERAL:

A. SUMMARY: Provide Site and Traffic Signage, as shown and specified per Contract Documents.

B. REFERENCES:
1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
2. Americans with Disabilities Act (ADA): Standards.
3. State of California, Department of Transportation (CalTrans): CalTRANS Standard Specifications.
4. U.S. Department of Transportation, Federal Highway Administration (FHWA): Manual Uniform Traffic Control Devices for Streets and Highways.

C. SUBMITTALS:
1. General: Submit product data, shop drawings and samples.
2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
1. Traffic Signage:
   a. General: Custom signs manufactured by Safeway Sign Co.
   b. Alternate Manufacturers: Comparable products manufactured by Western Highway Products, Inc., or approved equal.
   c. Plaque Signs: Provide manufacturer's standard silk-screened signs, baked-on enamel applied over reflectorized backing on .125 aluminum sheet.
   d. Sign Text:
      1. Traffic and Regular Parking Control:
         a) General: Comply with requirements of State of California, Department of Transportation (CalTrans) Standard Specifications and regulations of jurisdictional agencies.
         b) Stop Signs: As shown, comply with jurisdictional ordinances.
         c) Reserved Parking: Identification as shown.
      2. Accessible Parking Control:
         a) General: Comply with (CBC), State of California, Department of Transportation (CalTrans) Standard Specifications and regulations of local authorities having jurisdiction.
         b) Van Accessible Parking Sign: 12 inches wide x 18 inches high displaying the international symbol of accessibility; text below the symbol to read "RESERVED PARKING".
      3. Accessible Route: As shown; comply with ADA requirements.
      4. Recycling: As shown; comply with (CBC) requirements.
      5. No Smoking: As shown; comply with jurisdictional smoking ordinances.
   e. Accessories: Provide welded galvanized steel fittings and galvanized or cadmium-plated steel bolts, nuts and washers.
   f. Fasteners:
      1. General: Tufnut Security Nuts tamper-proof galvanized steel fasteners manufactured by The Tufnut Works; size as required.
      2. Alternate Manufacturers: Comparable products manufactured by Allegheny Bolt and Screw Corp., or approved equal.

3. EXECUTION:

A. PREPARATION:
1. Examination: Examine conditions of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Site Traffic Signage: Locations as shown, or as directed by the City Representative.
3. Building Identification: Refer to Section 10 14 75 - BUILDING IDENTIFICATION.

* * *

BUILDING IDENTIFICATION Section 10 14 75

1. GENERAL:

A. SUMMARY: Provide Building Identification, as shown and specified per Contract Documents.
B. REFERENCES:
   1. Aluminum Association (AA): Finishing Standards.
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   3. Copper Development Association (CDA): Properties of Wrought and Cast Copper Alloys.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. Building Identification:
      a. Dimensional Letters:
         1. General: Products are manufactured by Metallic Arts, Inc.
         2. Alternate Manufacturers: Comparable products manufactured by A.R.K. Ramos Manufacturing Co., Inc., or approved equal.
         3. Appearance: Polished face and matte finished sides.
         4. Aluminum:
            a) Castings:
               1) General: Manufacturer's standard cast aluminum.
               2) Recycled Aluminum Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost) of the total value of the materials for the project.
            b) Extrusions: ASTM B221; minimum 6063-T5.
            c) Style: Neutra.
            d) Size: As shown..
               1) Finish: Clear anodized AA-M31A31 on face, AA-M35A31 on sides.
      b. Mounting:
         1. General: Manufacturers standard projected mounting.
         2. Fastenings and Spacers: Corrosion resistant, as recommended by manufacturer; silhouette spacers to match letter material.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Location: As shown.
   3. Titles Required: As shown.
   4. Building Identification:
      a. Dimensional Letters: Spacing as recommended by manufacturer.
      b. Mounting: Drill holes for fasteners in mounting surface not more than 1/16 inch larger than fastener; place with quick-setting collars or sleeves over fasteners. Three (3) fasteners per letter; two (2) fasteners for letter "I"; secure from back; fasteners not visible from face. Set in bed of sealant.
   5. Address Signs:
      a. General: Install as shown.
      b. Electrical: Refer to Division 26 - ELECTRICAL.

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TELEPHONE SPECIALTIES Section 10 17 00

1. GENERAL:

A. SUMMARY: Provide Telephone Specialties, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Emergency Telephone:
      a. General: 1600 A Series ADA Compliant Emergency Phones manufactured by Viking Electronics, or approved equal.
   2. Telephone Instrument: Per telephone service company requirements.
   3. Fasteners: Tamperproof; as recommended by manufacturer.

3. EXECUTION:

A. PREPARATION: Examine conditions of work in place before beginning work; report defects.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Indoor Enclosures: As shown.
   3. Outdoor Enclosures: As shown.
   4. Telephone Instrument: Instrument, wiring and connection to service per telephone company requirements

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WALL PROTECTION Section 10 26 00

1. GENERAL:

A. SUMMARY: Provide Wall Protection, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American National Standards Institute (ANSI): ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable By Physically Handicapped People.
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   3. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. Wall and Corner Guards:
      a. General: Specified products are manufactured by Alpar Architectural Products, LLC.
      b. Alternate Manufacturers: No known equal.
      c. Corner Guard: Model No. SSCG; height, wing size and angle as shown.
   2. Fasteners: Manufacturer's standard, and as shown.
   3. Adhesive: Manufacturer's standard.

3. EXECUTION:

A. PREPARATION:
   1. Scheduling: Coordinate the work with wall or partition sections for installation of concealed blocking or anchor devices.
   2. Examination: Examine conditions of work in place before beginning work; report defects.
   3. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Corner Guards: Install components per manufacturer's instructions, level and plumb, secured rigidly in position to wall framing members. Terminate rails 6 inches short of door openings and intersecting walls.

* * *

TOILET ACCESSORIES Section 10 28 13

1. GENERAL:

A. SUMMARY: Provide Toilet Room Accessories, as shown and specified per Contract Documents.
B. REFERENCES:
1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
2. American National Standards Institute (ANSI):
a. ANSI 117.1: Safety Standards for the Handicapped.
b. ANSI Z97.1: Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.
3. Americans with Disabilities Act (ADA):
a. General: Americans with Disabilities Act of 1990, ADA - 42 U.S. Code Chapter 126.
b. ADA Standards for Accessible Design: U.S. Department of Justice, 28 CFR Part 36.
c. ADA Accessibility Guidelines for Buildings and Facilities (ADAAG):
1. General: Appendix A to Part 1191.
2. Checklist: ADAAG Checklist for Buildings and Facilities.
4. International Sanitary Supply (ISSA): Standards.
5. California Building Code (CBC): Section 1115B.8.
C. SUBMITTALS:
1. General: Submit product data and samples.
2. Closeout:
a. General: Submit maintenance data.
b. Guarantee:
1. General: Submit in required form for a period of one (1) year from date of final acceptance by Owner.
2. Welded Stainless Steel Framed Mirrors: Fifteen-year (15) year guarantee against silver spoilage.

2. PRODUCTS:

A. MATERIALS:
1. Manufacture:
a. General: Classic or Contura Series as shown, manufactured by Bobrick Washroom Equipment, Inc., unless otherwise indicated; key lockable accessories alike.
b. Alternate Manufacturers: Comparable products manufactured by American Specialties, Inc., or approved equal.
c. Finishes: Type 304 stainless steel; No. 4 satin finish, unless otherwise specified.
d. Templates and Backplates: Furnish to applicable trades as required for each accessory together with location and mounting height.
2. Toilet Accessories:
a. Multi-purpose Unit: Toilet seat cover/toilet tissue dispenser, side wall mounted, Model No. B-3474, recessed.
b. Mirrors:
1. General: Mirror glass per ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q1 mirror select, 1/4 inch thick; sizes as shown.
2. Safety Backing: Clear vinyl backing conforming to ANSI Z97.1-1975 and CPSC 16 CFR 1201 Category II; manufactured by Buckmin Industries, or approved equal.
3. Framed Mirrors:
a) General: Stainless steel, with countersunk "theftproof" screws.
b) Frame: Model No. B-290; size as shown.
c) Backs: Resilient filler and galvanized steel or hardboard backing plate, without filler; attach with "theftproof" concealed hangers. Corrugated cardboard or other moisture absorbent filler not acceptable.
c. Shelves: Model No. B-676; length as shown.
d. Paper Towel Dispensers: Surface mounted; Model No. B-263 for singlefold towels.
e. Soap Dispensers: Wall mounted Georgia Pacific, Model No. 53053 Manual Soap and Sanitizer Dispenser; liquid soap.
f. Grab Bars: Series No. B-5806; 18 gage 1-1/4 inch o.d. stainless steel tubing; size as shown.
g. Toilet Tissue Dispensers: Surface mounted; Model No. B-6867, 2 roll capacity.
h. Shower Curtain Rod: Model No. B-6047; 1-1/4 inch diameter, length as required.
i. Folding Shower Seat: Model No. B-5191.
j. Towel Bar: Model No. B-530, extra heavy duty; 18 or 24 inch, as shown.
k. Towel Pin: Model No. B-6777.
l. Robe Hooks: Single; Model No. B-6717.

m. Mop and Broom Holder: Model No. B-239; 34 inch.

3. Corner Guard:
   a. General: CO Series manufactured by Construction Specialties, Inc.; condition and height as shown; furnish for adhesive mounting.
   b. Alternate Manufacturers: Comparable products manufactured by Bobrick Washroom Equipment, Inc., or approved equal.
4. Shower Doors:
   a. General: Model No. 950 Sterling Standard Pivot Shower Door with clear anodized aluminum finish and obscure glass as manufactured by the Kohler Co.; size as shown.
   b. Alternate Manufacturers: Comparable products manufactured by American Shower Door Co., or approved equal.
5. Fasteners: As recommended by manufacturer; non-corrosive, tamperproof type.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.

B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified. Conceal evidence of drilling, cutting, and fitting to room finish under accessory.
   2. Toilet Room Accessories: Install at locations and heights shown, with concealed vandal-proof fasteners where mountings are made without back plates and where accessories are recessed or fastener is exposed to view. Where possible, mount accessories back-to-back. Attach accessories securely to walls or toilet partitions as recommended by manufacturer for each item and each condition; adhesive installation not permitted.
   3. Grab Bars:
      a. General: Anchor grab bars to withstand minimum downward pull of 500 lbs. Secure grab bars to preset mounting plates screwed to studs or backing plate, using brass or stainless steel vandal proof fastenings. Where mounted on toilet partitions, provide back-to-back sleeves per manufacturer's recommendations.
      b. At Toilets: Install per CBC 1115.7.1.3.; accessories shall not be located closer than 1-1/2 inch clear from the tangent point of the grab bar.
   4. Shower Doors: Hang level, straight and plumb; completely watertight.

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FIRE EXTINGUISHERS AND CABINETS Section 10 44 13

1. GENERAL:

A. SUMMARY: Provide Fire Extinguishers and Cabinets, as shown and specified per Contract Documents.

B. REFERENCES:
1. American National Standards Institute (ANSI):
   a. ANSI/NFPA 10: Portable Fire Extinguishers.
   b. ANSI/UL 711: Rating and Fire Testing of Fire Extinguishers.
2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
3. Intertek Testing Services (ITS): Approval for type, rating and classification of extinguisher.
4. National Fire Protection Association (NFPA): Fire Extinguisher Standards.
5. Underwriters Laboratories, Inc. (UL): Listing for type, rating and classification of extinguisher.

C. SUBMITTALS:
1. General: Submit product data.
2. Certificates: Submit manufacturer's certificate stating that materials meet or exceed specified requirements.
3. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience; manufacturer approved. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
1. Manufacture:
   a. General: Manufactured by the Potter-Roemer.
   b. Alternate Manufacturers: Comparable products manufactured by J.L. Industries Division of the Activar Construction Products Group, or approved equal.
2. Cabinets:
   a. General: 1770 Series.
   b. Mounting: Semi-recessed mounted typical.
   c. Material and Finish: White tub with red door and trim.
   d. Size: Manufacturer's standard.
   e. Glazing: Clear glass; color as selected by the City Representative.
   f. Lettering: Manufacturer's standard, vertical; color as selected by the City Representative.
3. Extinguishers:
   a. General: Fire fighting devices must be approved by Underwriters Laboratories, Inc., bear UL label, and approved by Fire Marshal.
   b. Cabinet Type: Multi-purpose Dry Chemical; Model No. 3005 (2A-10B:C).
4. Fasteners: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
1. Environmental Requirements: Do not install when temperatures may cause freezing of extinguisher ingredients.
2. Examination: Examine conditions of work in place before beginning work; report defects.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Cabinets: Where shown; anchor components firmly in place.
3. Wall Brackets: Install as required by codes and regulations or as shown; anchor components firmly in place.
4. Extinguishers: One (1) extinguisher for each cabinet.

C. SERVICE: Inspect, charge and tag fire extinguishers not more than ten (10) days prior to occupancy of building by Owner.

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METAL TURN-OUT LOCKERS Section 10 51 63

1. GENERAL:

A. SUMMARY: Provide Metal Turn-out Lockers, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. Americans with Disabilities Act (ADA):
      a. General: Americans with Disabilities Act of 1990, ADA - 42 U.S. Code Chapter 126.
      b. ADA Standards for Accessible Design: U.S. Department of Justice, 28 CFR Part 36.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Metal Turn-out Lockers:
      a. General: Custom fabricated from Model NO. 5578HDDP manufactured by Lyon Workspace Products, LLC.
      b. Alternate Manufacturers: No known equal.
      c. Size: 24 inches x 24 inches 72 inches.
      d. Construction:
         1. General: Cold rolled steel with flat top, no base legs, 45% ventilation and all welded construction.
         2. Opening:
            a) General: Manufacturer's standard door and frame.
            b) Hardware: Recessed stainless steel with padlock attachment and piano hinges.
         3. Interior Equipment:
            a) General: Provide shelf and coat rod at top as shown.
            b) Hooks: Three (3) manufacturer's standard paired hooks.
      e. Finish: Manufacturer's standard heavy duty powder coating; color selected by the City Representative.
      f. Name Plates: Provide an iInterchangable name tag holder on each locker.
   2. Fasteners:
      a. General: Cadmium plated steel.
      b. Washers: Provide lock washers for nuts on moving parts; prevent loosening of nuts.
      c. Anchors: As shown.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Placement: Install lockers plumb, level, secure, rigid and flush.
   3. Anchorage: Install with concealed bolts, to solid anchorage. Secure lockers to walls and base as shown; bolt locker units together.
   4. Trim: Provide hairline joints flush against adjacent materials or locker components.
   5. Ventilation: Provide perforations in sides, tops, doors and shelves to permit 45% ventilation through locker.

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SAFETY STORAGE CABINET Section 10 51 73

1. GENERAL:

A. SUMMARY: Provide Safety Storage Cabinet, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. National Fire Protection Association (NFPA): Materials safety storage standards.
   3. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data and shop drawings.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. LEED Certification Requirements:
      a. Recycled Metal Content: Use steel with recycled content such that the sum of post-consumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost) of the total value of the materials for the project.
   2. Safety Storage Cabinet:
      a. General: Flammable Safety Cabinet Model No. 894500 manufactured by W. W. Grainger, Inc..
      b. Alternate Manufacturers: Comparable products manufactured by the Justrite Manufacturing Co., or approved equal.
   3. Padlock: Refer to Section 08 71 00 - DOOR HARDWARE.
   4. Anchors: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

* * *

POSTAL SPECIALTIES Section 10 55 00

1. GENERAL:

A. SUMMARY: Provide Postal Specialties, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. Postal Equipment:
      a. General: Manufactured by Salsbury Industries.
      b. Alternate Manufacturers: Comparable products manufactured by Cutler Manufacturing Division of the Florence Corp., or approved equal.
      c. Letter Box: Model No. 2245 AP recessed mounted, aluminum.
   2. Fasteners: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Anchorage: As shown, per manufacturer's instructions; tamperproof where exposed.

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FIRE HOSE STORAGE SHELVES Section 10 56 30

1. GENERAL:

A. SUMMARY: Provide Fire Hose Storage Shelves, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
C. SUBMITTALS:
   1. General: Submit product data.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. LEED Certification Requirements:
      a. Recycled Metal Content: Use steel with recycled content such that the sum of post-consumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost) of the total value of the materials for the project.
   2. Fire Hose Storage Shelves:
      a. General: Fire Hose Rack manufactured by the Spacesaver Corp.
      b. Alternate Manufacturers: No known equal.
      c. Size: 48 inches wide; height as shown.
      d. Finish: Manufacturers standard powder coat.
   3. Anchors: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

* * *

WALL STORAGE ASSEMBLY Section 10 56 43

1. GENERAL:

A. SUMMARY: Provide Wall Storage Assembly, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
C. SUBMITTALS:
   1. General: Submit product data.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. LEED Certification Requirements:
      a. Recycled Metal Content: Use steel with recycled content such that the sum of post-consumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost) of the total value of the materials for the project.
   2. Safety Storage Cabinet:
      a. General: Wall Control 8 ft. Metal Pegboard Master Workbench Kit with Red Toolboard and White Accessories manufactured by Wall Control Storage Systems and distributed by Home Depot .
      b. Alternate Manufacturers: No known equal.
   3. Anchors: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

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WALL MOUNTED FLAGPOLE Section 10 75 23

1. GENERAL:

A. SUMMARY: Provide Wall Mounted Flagpole, as shown and specified per Contract Documents.

B. REFERENCES:
1. Aluminum Association (AA): The Surface Treatment and Finishing of Aluminum and its Alloys.
2. Aluminum Anodizers Council (AAC): Finishing standards.
3. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.

C. SUBMITTALS:
1. General: Submit product data, shop drawings and samples.
2. Closeout: Submit guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

D. QUALITY ASSURANCE: Design criteria for flagpole is to be resistant without permanent deformation, 80 mph wind velocity, non-resonant, safety design factor of 2.5, flagged with 5'-0" x 8'-0" flag.

2. PRODUCTS:

A. MATERIALS:
1. Wall Mounted Flagpole:
   a. General: VSS - Vertical Single Stationary Flagpole (VSS25C5X) manufactured by American Flagpole, Inc.
   b. Alternate Manufacturers: Comparable products manufactured by Concord Industries, Inc., or approved equal.
   c. Recycled Aluminum Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost) of the total value of the materials for the project.
   d. Size: As shown.
   e. Wall Mounting: Model No. WA-1.
   f. Accessories:
      1. General: Ball, truck, halyard and cleat manufacturer's standard.
      2. Finial Ball: Aluminum; 5 inch diameter.
   g. Fasteners: Aluminum or stainless steel; as recommended by manufacturer.
   h. Finish:
      1. General: Satin brush finish on exposed aluminum, 80 grit or finer; color as selected by the City Representative; finish with paste wax.
      2. Finial Ball: Clear anodized.
   i. Grounding Cable: Copper; No. 6 AWG, soft drawn.

3. EXECUTION:

A. PREPARATION:
1. Examination: Examine conditions of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.
3. Delivery: Spiral wrap flagpole with protective covering and pack in protective shipping container before transporting to site.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Dissimilar Metals: Coat contacting dissimilar metals with 7-1/2 mil thickness, minimum, of asphaltic paint, each surface.
3. Pole:
   a. General: Set pole plumb and electrically ground per manufacturer's instructions.
   b. Fittings: Install as directed.
   c. Tolerances: Maximum variation from plumb of 1 inch in 25'-0".

* * *

BIRD CONTROL DEVICES Section 10 81 13

1. GENERAL:

A. SUMMARY: Provide Bird Control Devices, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. Bird Control:
      a. General: Model No. S manufactured by Nixalite of America.
      b. Alternate Manufacturers: Comparable products manufactured by Fly Bye Bird Control Products, or approved equal.
      c. Quantity: Provide 250 linear feet.
   2. Adhesive: As recommended by manufacturer; compatible with application surface.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified. Place in locations as directed by Owner's representative.

* * *

MISCELLANEOUS SPECIALTIES Section 10 95 00

1. GENERAL:

A. SUMMARY: Provide Miscellaneous Specialties, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. Miscellaneous Specialties:
      a. T.V. Mounting System:
         1. General: Manufactured by the Lucasey Manufacturing Corp.
         2. Alternate Manufacturers: Comparable products manufactured by Peerless Industries, Inc., or approved equal.
         3. Flat Screen Wall Mounting Bracket:
            a) General: Verify following with Owner's Representative before installation.
            b) Type 1: Small Wall Mount Model No. LC200DS2; triple articulating.
            c) Type 2: Large Wall Mount Model No. FSWADS2; articulating with tilt.
      b. Stainless Steel Wall Shelves:
         1. General: Manufactured by the BK Resources.
         2. Alternate Manufacturers: No known equal.
         3. Type 1: Model No. BKWS-1624.
         4. Type 2: Model No. BKWS-1636.
      c. Mailbox:
         1. General: Model No. 4145P-WHT manufactured by Salsbury Industries; provide mounting hardware as required.
         2. Alternate Manufacturers: Comparable products manufactured by Cutler Manufacturing Division of the Florence Corp., or approved equal.
      d. Lock Box:
         1. General: 3200 Series manufactured by the Knox Co., color selected by the City Representative.
         2. Alternate Manufacturers: Vator Accessories, Inc., or approved equal.
   2. Fasteners: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Flat Screen Mounting System: Anchor as shown.
   3. Stainless Steel Wall Shelves: Anchor as shown.
   4. Mailbox: Install as shown.
   5. Lock Box: Per manufacturer's instructions, as shown.

* End Division 10 *

Division 11 - EQUIPMENT

SCBA COMPRESSOR Section 11 11 16

1. GENERAL:

A. SUMMARY: Provide SCBA Compressor, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. American Society of Mechanical Engineers (ASME): Standards for compressed air cylinders.
   3. National Electrical Manufacturers Association (NEMA): NEMA 250 - Enclosures for Electrical Equipment.
   4. National Fire Protection Association (NFPA): NFPA 1901 - Standard for Automotive Fire Apparatus.
   5. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of five (5) years from date of final acceptance by Owner.
D. QUALITY ASSURANCE:
   1. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience manufacturer approved. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. EQUIPMENT:
   1. SCBA Compressor:
      a. General: Unicus III, Model No. UN III/25H-E3 manufactured by Bauer Compressors, Inc.
      b. Alternate Manufacturers: No equals will be accepted.
      c. Accessories: Manufacturer's standard CO Monitor, 75'-0" high pressure reel mounted on the outside of cabinet, additional air storage cylinders and panel mounted remote fill hose connection.
   2. Anchors: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Electrical Connection: Refer to Division 26 - ELECTRICAL.
C. FIELD QUALITY CONTROL After installation, demonstrate that the unit operates properly and that special features function within requirements.

* * *

FIREMAN'S PPE DRYING CABINET Section 11 23 53

1. GENERAL:

A. SUMMARY: Provide Fireman's PPE Drying Cabinet, as shown and specified per Contract Documents.

B. REFERENCES:
1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
2. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.

C. SUBMITTALS:
1. General: Submit product data and samples.
2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
1. Drying Cabinet:
   a. General: UniMac Model No. UTGCEDG44 manufactured by Alliance Laundry Systems.
   b. Alternate Manufacturers: No equals will be accepted.
   c. Design Requirements:
      1. Dry Capacity: 6 full sets of PPE and 15 boot / glove holders.
      2. Cabinet Volume: 69 cu ft (1953862 cu cm) minimum.
      3. Construction: Heavy duty embossed steel with baked enamel powder paint.
      4. Input Voltage: 240/60/3.
      5. Heat Source: Electric, 12 kW.
      6. Overall Width: 61-1/8 inches (1550 mm) nominal.
      7. Overall Height: 80-3/8 inches (2041 mm) nominal.
      8. Overall Depth: 32-5/8 inches (828 mm) nominal.
      9. Exhaust Size: 6 inch (153 mm).
      10. Control System: Programmable touchpad control.
      11. Door: Painted steel double doors with heavy duty 180 degree opening hinges.
      12. Leveling: 4 adjustable leveling legs.
   d. Performance Requirements:
      1. Airflow: 300 CFM (5.5 CMM).
      2. Motor Horsepower: 2 x 1/8 hp.
      3. Control System: Minimum of five programmable drying cycles. Ability to time dry up to 555 minutes. Ability to cool from 2 minutes to 60 minutes. Variable temperature settings from 100 - 150 degrees F (38 - 65 degrees C).
      4. Boot / Glove Holders: 15.

3. EXECUTION:

A. PREPARATION:
1. Examination: Examine conditions of work in place before beginning work; report defects.
2. Measurements: Take field measurements; report variance between plan and field dimensions.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Drying Cabinet:
   a. General: Install as shown; coordinate service connection with Division 22 - PLUMBING and Division 26 - ELECTRICAL.
   b. System Start-up and Commissioning: Arrange for a local manufacturer's representative to inspect machines prior to start-up and operation.

* * *

RESIDENTIAL APPLIANCES Section 11 31 00

1. GENERAL:

A. SUMMARY: Provide Residential Appliances, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. Americans with Disabilities Act (ADA): Access to Buildings requirements.
   3. Association of Home Appliance Manufacturers (AHAM): Standards.
   4. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory, Building Material Directory and standards for electrical equipment.
C. SUBMITTALS:
   1. General: Submit product data and shop drawings.
   2. Samples: Submit manufacturer's standard colors.
   3. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. EQUIPMENT:
   1. Gas Cooking Appliance:
      a. Range:
         1. General: BlueStar 60 Inch RNB Heritage Classic manufactured by Blue Star/Prizer-Painter Stove Works, Inc.
         2. Alternate Manufacturers: No equals will be accepted.
      b. BBQ Grill:
         1. General: Summit E-470 Grill, with rotisserie, as manufactured by Weber-Stephen Products LLC.
         2. Alternate Manufacturers: No equals will be accepted.
   2. Electric Cooking Appliances:
      a. Convection/Microwave Oven:
         1. General: Model No. PEB1590SMSS manufactured by the General Electric Co.
         2. Alternate Manufacturers: No equals will be accepted.
      b. Exhaust Hood for Range: Refer to Section 23 34 16 - CENTRIFUGAL HVAC FANS.
      c. Automatic Coffee Brewer:
         1. General: Model No. 07400.0005, VLPF, low profile with two (2) warmer's, as manufactured by Bunn Coffee Makers.
         2. Alternate Manufacturers: No equals will be accepted.
         3. Decanter: Model No. 06100.0101 Easy Pour black decanter.
   3. Refrigerator:
      a. General: Model No. PDCS1NCZLSS manufactured by the General Electric Co., 120v, with Model No. WX08X10006 SmartConnect tubing kit; stainless steel.
      b. Alternate Manufacturers: No equals will be accepted.
   4. Food Waste Disposer: Refer to Section 22 41 00 - RESIDENTIAL PLUMBING FIXTURES.
   5. Dishwasher:
      a. General: Model No. SHX55R55UC manufactured by Bosch Home Appliances, 120v, stainless steel.
      b. Alternate Manufacturers: No equals will be accepted.
   6. Washer/Dryer:
      a. General: Commercial Homestyle topload washer and matching dryer manufactured by the Speedqueen Division of Alliance Laundry Systems LLC.
      b. Alternate Manufacturers: No equals will be accepted.
      c. Extractor:
         1. General: Model No. SX75PVX (75 lb, soft mount) manufactured by Speedqueen Division of Alliance Laundry Systems LLC.
         2. Alternate Manufacturers: No equals will be accepted.
   7. Finish: Colors selected by the City Representative.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

2. Kitchen Equipment: Install as shown; coordinate service connection with Division 22 - PLUMBING, Division 23 - HEATING, VENTILATING AND AIR CONDITIONING and Division 26 - ELECTRICAL.

* End Division 11 *

Division 12 - FURNISHINGS

WINDOW BLINDS Section 12 21 00

1. GENERAL:

A. SUMMARY: Provide Window Blinds, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
C. SUBMITTALS:
   1. General: Submit product data and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. Roller Shades:
      a. General: Model No. [?] manufactured by Lutron Shading Systems by VIMCO.
      b. Alternate Manufacturers: Comparable products manufactured by MechoShade Systems, Inc., or approved equal.
      c. Bottom-up Shade: Manufacturer's standard.
      d. Shade Cloth: Manufacturer's standard.
   2. Fasteners: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Horizontal Blinds: Install blinds, anchorages, fastenings and accessories as shown, level and in alignment with window opening. Provide brackets and intermediate supports to permit easy entrance and removal of head rail.
   3. Roller Blinds:
      a. General: Install with uniform space 2/3 width of window frame a sides of window and flush fit to sill.
      b. Bottom-up Shade: Install as shown.
      c. Motorized Shade: Install single and double shade where shown; coordinate service connection with Division 26 - ELECTRICAL.
C. ADJUSTMENT: Prior to acceptance, adjust moveable parts to assure smooth operation.

* * *

INTERIOR CLOCKS Section 12 46 19

1. GENERAL:

A. SUMMARY: Provide Interior Clock, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data and shop drawings.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Interior Clock:
      a. General: Model No. WT-3161WH manufactured by LaCrosse Technology.
      b. Alternate Manufacturers: Comparable products manufactured by Howard Miller, or approved equal.
   2. Fasteners: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Interior Clock: Install as shown

* * *

FLOOR MATS AND FRAMES Section 12 48 13

1. GENERAL:

A. GENERAL: Provide Floor Mats and Frames, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   2. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout:
      a. General: Submit maintenance data and guarantee in required form for a period of five (1) year from date of final acceptance by Owner.
      b. Extra Stock: Deliver one (1) percent or a minimum of one full container of each kind and type of tread insert installed.
D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Recessed Floor Mats:
      a. General: Rol-Dek EM-650-BF manufactured by the Pawling Corp., Architectural Products Division.
      b. Alternate Manufacturers: Comparable products manufactured by Construction Specialties Inc., or approved equal.
      c. Recycled Aluminum Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the preconsumer content constitutes at least 10% (based on cost) of the total value of the materials for the project.
      d. Frame: Model No. MRF-1005 recessed frame.
      e. Rail:
         1. General: Manufacturers standard aluminum; mil finish.
         2. Insert: Color selected by City Representative.
   2. Fasteners: Manufacturer's standard; use adjustable extruded masonry anchors at frames.

3. EXECUTION:

A. PREPARATION:
   1. Scheduling: Coordinate embedment of accessories in concrete.
   2. Examination: Examine conditions of work in place before beginning work; report defects.
   3. Measurements: Take field measurements; report variance between plan and field dimensions.
   4. Surface Preparation: Coordinate and verify that slab is finished with leveling screed to meet manufacturers performance requirements.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Recessed Floor Mats:
      a. General: Install per manufacturer's instructions, as shown.
      b. Floor Mat:
         1. Set mat at height recommended by manufacturer for most effective cleaning action.
         2. Door Swings: Coordinate top of mat surface with bottom of doors that swing across to provide ample clearance between door and mat.
   3. Electrolytic Protection: Use protective coating to isolate aluminum surfaces in contact with masonry.

* * *

BICYCLE RACKS Section 12 93 13

1. GENERAL:

A. SUMMARY: Provide Bicycle Racks, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS:
   1. Bicycle Racks: Model No. UX238-LBC-SF-PSmanufactured by Belson Outdoors, Inc.; galvanized steel finish.
      a. Alternate Manufacturers: No known equal.
   2. Fasteners:
      a. General: Cadmium plated steel; tamperproof at exposed bolt heads.
      b. Washers: Provide lock washers for nuts on moving parts; prevent loosening of nuts.
      c. Anchors: As shown.

3. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Placement: Install plumb, secure and rigid.
   3. Anchorage: As shown.

* End Division 12 *

Division 13 - SPECIAL CONSTRUCTION

TEMPORARY FIRE STATION Section 13 34 23

1. GENERAL:

A. SUMMARY:
1. General: Provide Engineered Fabric Structure, as shown and specified per Contract Documents.
2. Description:
   a. General: Provide labor, materials, equipment, appliances, services, supervision and transportation necessary to design, furnish, deliver, and install the fabricated structure where and as shown and/or specified herein, complete and ready for use by Owner.
   b. Location: As shown.
   c. Coordination: For items involving more than one section of these Specifications, coordinate work of trades and be responsible for installation of item.
   d. Utilities: Provide building utility hookups as shown.
   e. Prior Work:
      1. General: Work on this Project executed prior to the start of the Work of this Contract, and excluded from this Contract is as follows:
      2. Site Work:
         a) General: Site preparation as shown refer to Section 31 20 10 - EARTHWORK.
         b) Demolition: Refer to Section 02 41 00 - DEMOLITION.
      3. Site Utilities
         a) General: Refer to Section 33 00 10 - SITE UTILITY SERVICES.
         b) Electrical Power: As shown.
   f. Subsequent Work:
      1. General: Work to be executed after completion of this Project and excluded from this Contract is as follows:
      2. Paving: Refer to Section 32 12 16 - ASPHALT PAVING.

B. REFERENCES:
1. Aluminum Association (AA): The Surface Treatment and Finishing of Aluminum and its Alloys.
2. Aluminum Anodizers Council (AAC): Finishing standards.
3. American Architectural Manufacturers Association (AAMA): Standards.
4. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
5. National Electrical Manufacturers Association (NEMA):
   a. NEMA 250: Enclosures for Electrical Equipment (1000 Volts Maximum).
   b. NEMA ICS 2: Standards for Industrial Control Devices, Controllers and Assemblies.
   c. NEMA MG1: Motors and Generators.
6. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.

C. SUBMITTALS:
1. General: Submit product data and samples.
2. Submittal Drawings
   a. Design and Construction Documents:
      1. General: Submit construction documents based on the schematic plans shown on the Drawings, as required to obtain required approval. Arrangement of systems shown are diagrammatic and indicate minimum requirements. Where size, capacity, model, style or other pertinent information is not indicated, provide equipment, seismic bracing system, fixtures or materials of size, quality and utility which will adequately serve the building and conform to CBC requirements.
      2. Drawings:
         a) General: Prepare on 24 inch x 36 inch transparent reproduction material.
         b) Plans: Provide construction drawings ordered and numbered as follows:
            TS1.1 SITE PLAN; Scale: 1/8"=1'-0".
            TS2.1,2 BUILDING PLANS (Foundation, layout, framing, etc.); Scale: 1/4"=1'-0".
            TS4.1,2 ELEVATIONS; Scale 1/4"=1'0".
            TS5.1,2 SCHEDULES, DETAILS, etc.; Scale as required to present a completely clear solution to the specified Design Requirements.
            TS6.1,2 MECHANICAL AND ELECTRICAL; Floor plan layout on background of Building Plan as described in TS2.1, above; show location and coordinate installation of exhaust removal system specified in Section

23 34 16.10 - VEHICLE EXHAUST REMOVAL SYSTEM; electrical as shown.

c) Specifications: Incorporate all information needed to adequately describe installation. Use CSI three part Section format.
d) Calculations: As required by CBC applicable codes, local ordinances and in compliance with the stated design requirements.

b. Submittal:
1. General: Submit specified drawings, calculations and specifications to City Representative for review before submittal to Building Department. Upon receipt of comments of City Representative's review, incorporate requested revisions and prepare Building Department submittal.
2. Submittal Requirements: Submit plans, specifications, calculations, and other supporting documents required by this Section to Building Department. Permit fee will be paid by Owner. Make changes or corrections required by Building Department.
3. Approved Documents: Forward copy of approved drawings, specifications and calculations to City Representative for distribution. Do not begin construction until plans and specifications have been approved and building permit has been issued.

3. Closeout: Submit maintenance data and manufacturers maximum standard guarantee in required form commencing from the date of final acceptance by Owner.

D. QUALITY ASSURANCE:
1. Qualifications:
a. General: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
b. Submittal Documents: Prepared by a structural engineer registered to practice in the State of California.

2. PRODUCTS:

A. MATERIALS:
1. General: High Performance Fabric Building manufactured by Sprung Instant Structures, Ltd.
2. Alternate Manufacturers: Comparable products manufactured by Clamshell Buildings Inc., or approved equal.
3. Size and Configuration: As shown.
4. Substructure: Sprung aluminum.
5. Roof/wall Membrane:
a. General: Performance Architectural Membrane; 24 oz. per square yard with DuPont Tedlar coating that protects against UV and airborne contaminants; fire retardant.
b. Color: Color selected by the Architect.
6. Insulation: Manufacturers standard; u-value as required.
7. Personnel Doors: Manufacturers standard; key as directed.
8. Rolling Service Doors:
a. General: Manufacturers standard overhead rolling door.
b. Operators:
1. General: Manufacturer's standard; locks and cylinders provided under Section 08 71 00 - DOOR HARDWARE.
2. Push-Up: Handle in curtain with lockable latch mounted on each guide.
3. Power: Provide with NEMA 1 motor controller and overcurrent protection. Provide curtain with safety device mounted on bottom bar and emergency crank operation.
4. Motor: 1 hp minimum.
5. Door Controls:
a) Exterior: Flush mounted keyed switch; open/close station, momentary contact.
b) Interior: Manufacturer's standard flush mounted three (3) button station with key operated on/off switch.
c) Radio Controls: Provide in coordination with City Representatives requirements.
d) Audible and Visual Signals: Provide audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

9. Anchors: As required.
10. Fasteners: As recommended by manufacturer; tamper proof type; anchors as shown.
11. Sealant: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
1. Examination:
a. General: Examine conditions of work in place before beginning work; report defects.

b. Paving: Verify that anchorage surface is prepared and ready for installation of structure and that exposed concrete surfaces are clean, smooth, uniform, without visible voids, or other surface blemishes.
c. Service Connections: Verify that utility requirement characteristics of service and operating equipment are compatible with building utilities and connections are placed correctly for connection of services to modular units.

2. Delivery: Transport fabricated structure in compliance with requirements for transportation on public streets and highways.

B. INSTALLATION:
1. Surface Preparation: Provide anchorage base as shown; refer to Sections 31 20 10 - EARTHWORK, 32 12 16 - ASPHALT PAVING, and 03 30 00 - CAST-IN-PLACE CONCRETE and as required.
2. Placement:
a. Fabricated Structures: Position, anchor and connect fabricated structures as shown.
b. Connection to On-site Electrical Services: Refer to Section 33 00 10 - SITE UTILITY SERVICES. Coordinate Work of various contractors having interdependent responsibilities for installing, connecting to, and placing equipment in service.
c. On-site Installation of Products and Fabricated Items: Perform as required in conformance with CBC requirements, jurisdictional requirements, referenced standards, manufacturer's written directions, as shown, and as specified. Install owner furnished equipment as directed.
d. Vehicle Exhaust Removal System: Refer to Section 23 34 16.10 - VEHICLE EXHAUST REMOVAL SYSTEM.
e. Starting and Adjusting: Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. ADJUSTMENT: Prior to acceptance, adjust operating equipment and moveable parts to assure smooth operation.

D. CLEANING: Keep premises free from accumulation of waste and rubbish. At the completion of work remove surplus materials, rubbish, debris and thoroughly clean exposed surfaces per that product manufacturer's instructions.

* End Division 13 *

Division 14 - CONVEYING EQUIPMENT

HOLELESS HYDRAULIC PASSENGER ELEVATOR — Section 14 24 26

4. GENERAL:

A. SUMMARY: Provide Holeless Hydraulic Passenger Elevator, as shown and specified per Contract Documents.

B. REFERENCES:
1. Americans with Disabilities Act (ADA):
   a. General: Americans with Disabilities Act of 1990, ADA - 42 U.S. Code Chapter 126.
   b. ADA Standards for Accessible Design:
      1. General: U.S. Department of Justice, 28 CFR Part 36.
      2. Accessability Guidelines for Buildings and Facilities (ADAAG): ADA Accessability Guidelines.
2. American National Standards Institute (ANSI): ANSI A117.1 - Accessible and Usable Buildings and Facilities.
3. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
4. American Society of Mechanical Engineers (ASME): ASME A17.1 - Handbook on Safety Code for Elevators and Escalators.
5. California Building Code (CBC): Title 24, Part 2; Chapter 11 (1116B.1.1 - 14 and 1117B.5.1 - 7).
6. California Code of Regulations (CCR): Title 8 - Elevator Safety Orders.
7. Underwriters Laboratories, Inc. (UL):
   a. General: Fire Resistance Directory and Building Material Directory.
   b. UL-10B: Fire Tests of Door Assemblies.

C. SUBMITTALS:
1. General: Submit product data, shop drawings and samples.
2. Certificates: Submit inspection certificates of governing authorities.
3. Closeout:
   a. General: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
   b. As-built Wiring Diagrams, Operating and Maintenance Manuals: Provide one (1) set at the machine room and one (1) set to Facilities Division.

D. QUALITY ASSURANCE:
1. Design Criteria:
   a. Contract Speed: Within 5% under any loading condition, in up direction; contract speed or faster, in down direction.
   b. Leveling: Within 1/4 inch under any loading condition, in direction of car travel, without overshooting.
   c. Working Pressure: Maximum 400 psi for hydraulic equipment.
2. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience; manufacturer approved. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

5. PRODUCTS:

A. MATERIALS:
1. Holeless Hydraulic Passenger Elevator:
   a. General: HydroFit Hydraulic Elevator as manufactured by the Otis Elevator Division of United Technologies.
   b. Alternate Manufacturers: Comparable products manufactured by the Schindler Elevator Co., or approved equal.
   c. Building Code Requirements: Refer to California Building Code (CBC) - Title 24, Part 2; Chapter 11 (1116B.1.1 - 14 and 1117B.5.1 - 7).
   d. Rated Capacity: 2,500 pounds.
   e. Car Speed: 100 feet per minute.
   f. Stops: Two (2) stops with openings at front of hoistway; 60'-0" rise, maximum.
   g. Platform: Size as shown.
   h. Entrance Type and Width: Front opening; 3'-6" x 7'-0".

2. Hoistway Equipment:
   a. General: Manufacturer's standard hoistway operating devices, guide rails, hoistway fascia, carframe and safety.
   b. Platform: Manufacturer's standard steel, with aluminum threshold.
3. Power:
   a. Machine Unit: Hydraulic.
   b. Electrical:
      1. General: 208 Volts, 3 Phase, 60 Hertz.
      2. Lighting Supply: 120 Volts, 1 Phase, 60 Hertz.
4. Hoistway Entrances:
   a. General: Manufacturer's standard fire rated No. 4 stainless steel frames and doors.
   b. Sills: Extruded aluminum with non-slip wearing surfaces.
5. Car Enclosure:
   a. General: Manufacturer's standard cab, with 8'-0" canopy.
   b. Car Entrance: Door and frame to match hoistway entrance.
   c. Floor and Base:
      1. Floor: As scheduled.
      2. Base: Black powder coated.
   d. Walls:
      1. General: Manufacturer's standard No. 4 stainless steel.
      2. Car Front: Finish to match entrance.
      3. Handrail: Sides and rear; 1/2 inch x 2 inch; No. 4 stainless steel.
      4. Pad Hangers: Manufacturer's standard.
   e. Ceiling:
      1. General: No. 4 stainless steel with 9 equally spaced disc lights with brushed stainless steel frames.
      2. Ceiling Height: 8'-0".
6. Operation and Control:
   a. General: Simplex Collective Operation with microprocessor control.
   b. Signals:
      1. General: Vandal resistant fixtures, with satin stainless steel finish.
      2. Car Operating Panel: Locate at front of car with raised handicapped markings; illuminated landing destination buttons and car position indicator, with vocal landing passing and arrival announcement. Provide manufacturer's standard certificate frame.
      3. Hall Fixtures: Manufacturer's standard up and down call fixture, directional lantern, and car arrival chime bell.
      4. Operational Keys: Provide three (3) sets.
   c. Doors:
      1. General: Automatic; direct current powered with proximity-type door reversal device.
      2. Multiple Infrared Light Beam Electronic Sensing Device: Provide new multiple infrared light beam electronic sensing device securely and rigidly mounted on the car between the car and hoist way doors. The sensing device will have a minimum of 40 infrared beam sensors spaced evenly from the floor sill to the header jamb. When the car and hoist way doors are closing, the interruption of the light beam will cause the doors to reverse automatically to the full-open position and the doors to remain open as long as the light beams are interrupted; or, when the doors are in the open position, the interruption of the light beam will cause the doors to remain open as long as the light beams are interrupted. The time interval for the initiation of the door closing operation after light beams are reestablished will be adjustable. The sensing device will have an audible obstruction alarm which can be disabled.
      3. Nudging Action: In the event of an obstructed light beam is operated for a predetermined time interval (15 - 20 seconds) after automatic door closing has been initiated, a buzzer will sound and the doors will close with a maximum of 2.5 foot-pounds kinetic energy and at reduced speed. Timers will be adjustable.
      4. Variable Timing Features: In the event the light beam is interrupted while the doors are opening or after the doors are fully open, the time that the doors remain open after the beam has been reestablished will be reduced to an adjustable time between one and two seconds, depending upon whether a landing call or a car call predominated. This time will be a minimum time that the doors remain open if the beam is interrupted and reestablished before the door is full open.
      5. Provide door restrictive opening devices.
   d. Emergency Operation:
      1. General: Manufacturer's standard automatic emergency lowering.
      2. Firefighters Service: Per ASME A 17.1, including alternate floor return.
      3. Lighting: Manufacturer's standard, with battery pack.
      4. Hydraulic elevators will be provided with emergency power system that will activate in the

event of power failure and provide power to the hydraulic elevator and close the elevator doors, lowers the elevator to the designated landing, opens the doors allowing the passengers to exit, and then close the doors leaving the elevator at rest. The elevator doors can be re-opened from inside the elevator only if necessary. Upon resumption of power the emergency lowering device will automatically reset itself and the elevator will return to normal service.

7. Accessories:
   a. Telephone Cabinet: Manufacturer's standard, ADA compliant self dialing type.
   b. Wall Pads: Fire retardant, vinyl-covered elevator.
8. Diagnostic Tools and Software Manual:
   a. Should elevator/escalator controls require special maintenance equipment or tools, the elevator contractor will provide to the City, all required diagnostic tools and all supporting software documentation required for the complete maintenance of the control and dispatch system and all related elevator/escalator parts. Periodic upgrades and/or calibrations to the diagnostic tools will be provided as required. Elevator contractors will identify and list the type and description of function of the diagnostic tool(s) and control components requiring such tools and submit to the City before acceptance of the elevator/escalator.
   b. Diagnostic tools, whether hand-held or built into the control system, will not require recharging or reprogramming. Should recharging, re-calibrating, reprogramming or upgrading and any repair or if replacement of the diagnostic tool should be required, the contractor will provide these services indefinitely to the City immediately upon request at no additional cost for the lifetime of the equipment.

6. EXECUTION:

A. PREPARATION:
   1. Examination: Examine conditions of work in place before beginning work; report defects.
   2. Measurements: Take field measurements; report variance between plan and field dimensions.

B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Hoistway Equipment:
      a. General: Per manufacturer's directions; anchor rails to structure; guide rail supports specified under Section 05 12 00 - STRUCTURAL STEEL FRAMING.
      b. Angle Threshold: Refer to Section 05 50 00 - METAL FABRICATIONS.
   3. Power: Per Division 26 - ELECTRICAL.
   4. Hoistway Entrances: Angle thresholds as specified under Section 05 50 00 - METAL FABRICATIONS.
   5. Car Enclosure:
      a. General: Per manufacturer's directions.
      b. Floor and Base: As scheduled.
   6. Operation and Control: Rise between stops as shown. Ventilation per Division 23 - HEATING, VENTILATING AND AIR CONDITIONING; maintain temperature in machine room between 60 and 100 degrees F.
   7. Accessories:
      a. Telephone Cabinet: Install as shown.
      b. Wall Pads: Deliver to Owner with use instructions, on final acceptance of Project.
   8. Start-up Maintenance: Provide labor, parts, materials and equipment to furnish a complete preventive maintenance service that regularly and systematically examines the elevator equipment and provide the necessary repair and/or replacement for one (1) year from acceptance by the Owner.

C. FIELD QUALITY CONTROL: Upon completion, load platform to rated capacity and demonstrate operation in presence of City Representative and Inspector.

* End Division 14 *

Division 15 through 20 - UNASSIGNED

NOT USED

* End Division 20 *

Division 21 – FIRE SUPPRESSION

WET-PIPE SPRINKLER SYSTEMS Section 21 13 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following fire-suppression piping inside the building:
1. Automatic wet-type, sprinkler system.

1.3 DEFINITIONS

A. CPVC: Chlorinated polyvinyl chloride plastic.

B. CR: Chlorosulfonated polyethylene synthetic rubber.

C. High-Pressure Piping System: Fire-suppression piping system designed to operate at working pressure higher than standard 175 psig.

D. PE: Polyethylene plastic.

E. Underground Service-Entrance Piping: Underground service piping below the building.

1.4 SYSTEM DESCRIPTIONS

A. Automatic Wet-Type, Sprinkler System: Has open water-supply valve with pressure maintained and is capable of supplying water demand.

1.5 PERFORMANCE REQUIREMENTS

A. Standard Piping System Component Working Pressure: Listed for at least 175 psig.

B. Fire-suppression sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:
   a. Building Service Areas: Ordinary Hazard, Group 1.
   b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
   c. General Storage Areas: Ordinary Hazard, Group 1.
   d. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
   e. Office and Public Areas: Light Hazard.
3. Minimum Density for Automatic-Sprinkler Piping Design:
   a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
   b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
   c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
4. Maximum Protection Area per Sprinkler: Per UL listing.
5. Maximum Protection Area per Sprinkler:
   a. Office Spaces: 225 sq. ft..
   b. Storage Areas: 130 sq. ft..
   c. Mechanical Equipment Rooms: 130 sq. ft..
   d. Electrical Equipment Rooms: 130 sq. ft..
   e. Other Areas: According to NFPA 13 recommendations, unless otherwise indicated.
6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13, unless otherwise indicated:
   a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
   b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

C. Seismic Performance: Fire-suppression piping shall be capable of withstanding the effects of earthquake motions determined according to NFPA 13 and ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads.".

1.6 SUBMITTALS

A. Product Data: For the following:
1. Piping materials, including dielectric fittings, flexible connections, and sprinkler specialty fittings.
2. Pipe hangers and supports, including seismic restraints.
3. Valves, including listed fire-protection valves, unlisted general-duty valves, and specialty valves and trim.
4. Air compressors, including electrical data.
5. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.
6. Hose connections, including size, type, and finish.
7. Hose stations, including size, type, and finish of hose connections; type and length of fire hoses; finish of fire hose couplings; type, material, and finish of nozzles; and finish of rack.
8. Roof hose cabinets.
9. Monitors.
10. Fire department connections, including type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.
11. Alarm devices, including electrical data.

B. Shop Drawings:
   1. Proceed with preparation of shop drawings immediately upon receiving an authorization to proceed for the project. Submit prior to material fabrication, order and installation.
   2. In addition to the requirements specified elsewhere, the shop drawings shall include the following:
      a. Piping elevations.
      b. Double line piping (4" and larger).
      c. Actual size of purchased equipment.
      d. Access panels including ceiling panels.
      e. Access clearances for equipment.
      f. Diagram power, signal and control wiring.
      g. Locations of structural penetrations such as beams.
      h. Actual location of control panels and power connections to equipment.
      i. Color coded duct and piping based on material used.
      j. Minimum 1/4" scale drawings.
      k. Label and tag schedule for equipment.
      l. Pipe fittings to clear beams or tight areas.
      m. Sprinkler Head locations coordinated with ductwork, lights, ceiling diffusers, supply/return/exhaust registers, reflected ceiling plan and structural beams.
      n. Point of connection to utilities outside the building.
      o. Sections or 3-D drawings of congested areas.
      p. Grid lines.
   3. Coordinate with other trades. Submit a copy to General Contractor for distribution to other trades, including electrical and fire sprinkler contractor.
   4. Submit to commissioning agent for approval to assure design intent is met.
   5. Upon receiving approval from commissioning agent, submit a copy of shop drawings to mechanical engineer.

C. Fire-hydrant flow test report.

D. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations, if applicable.

E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13 and NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

F. Welding certificates.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For standpipe and sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
      a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

C. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:
   1. NFPA 13, "Installation of Sprinkler Systems."
   2. NFPA 14, "Installation of Standpipe, Private Hydrant, and Hose Systems."
   3. NFPA 230, "Fire Protection of Storage."

1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Sprinkler Cabinets: Finished, wall-mounting, steel cabinet with hinged cover, with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell end and plain end.
   1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern.

2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron gland, rubber gasket, and steel bolts and nuts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell end and plain end.
1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern.
2. Gaskets: AWWA C111, rubber.

C. Grooved-End, Ductile-Iron Pipe: AWWA C151, with factory- or field-formed, radius-cut-grooved ends according to AWWA C606.
1. Grooved-Joint Piping Systems:
a. Manufacturers:
1) Victaulic Co. of America.
2) Or equal.
b. Grooved-End Fittings: ASTM A 536, ductile-iron casting with OD matching ductile-iron-pipe OD and cement lining.
c. Grooved-End-Pipe Couplings: AWWA C606, gasketed fitting matching ductile-iron-pipe OD. Include ductile-iron housing with keys matching ductile-iron-pipe and fitting grooves, prelubricated rubber gasket with center leg, and steel bolts and nuts.
d. Grooved-End-Pipe Transition Coupling: UL 213 and AWWA C606, gasketed fitting with end matching ductile-iron-pipe OD and end matching steel-pipe OD. Include ductile-iron housing with key matching ductile-iron-pipe groove and key matching steel-pipe groove, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.
e. Grooved-End Transition Flange: UL 213, gasketed fitting with key for ductile-iron-pipe dimensions. Include flange-type, ductile-iron housing with rubber gasket listed for use with housing and steel bolts and nuts.

2.3 STEEL PIPE AND FITTINGS

A. Threaded-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, hot-dip galvanized where indicated and with factory- or field-formed threaded ends.
1. Cast-Iron Threaded Flanges: ASME B16.1.
2. Malleable-Iron Threaded Fittings: ASME B16.3.
3. Gray-Iron Threaded Fittings: ASME B16.4.
4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe hot-dip galvanized where indicated. Include ends matching joining method.
5. Steel Threaded Couplings: ASTM A 865 hot-dip galvanized-steel pipe where indicated.

B. Grooved-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, hot-dip galvanized where indicated and with factory- or field-formed, square-cut- or roll -grooved ends.
1. Grooved-Joint Piping Systems:
a. Manufacturers:
1) Anvil International, Inc.
2) Central Sprinkler Corp.
3) Victaulic Co. of America.

b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.

C. Threaded-End, Schedule 30 Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness less than Schedule 40 and equal to or greater than Schedule 30; or ASTM A 795 and ASME B36.10M, Schedule 30 wrought-steel pipe with factory- or field-threaded ends.
1. Cast-Iron Threaded Flanges: ASME B16.1.
2. Malleable-Iron Threaded Fittings: ASME B16.3.
3. Gray-Iron Threaded Fittings: ASME B16.4.
4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.
5. Steel Threaded Couplings: ASTM A 865.

D. Grooved-End, Schedule 30 Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness less than Schedule 40 and equal to or greater than Schedule 30; or ASTM A 795 and ASME B36.10M, Schedule 30 wrought-steel pipe; with factory- or field-formed, roll-grooved ends.
1. Grooved-Joint Piping Systems:
   a. Manufacturers:
      1) Anvil International, Inc.
      2) Central Sprinkler Corp.
      3) Victaulic Co. of America.
      4) Or equal.
   b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
   c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.

E. Grooved-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10; with factory- or field-formed, roll-grooved ends.
1. Grooved-Joint Piping Systems:
   a. Manufacturers:
      1) Anvil International, Inc.
      2) Central Sprinkler Corp.
      3) Victaulic Co. of America.
      4) Or equal.
   b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
   c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.

2.4 DIELECTRIC FITTINGS

A. Assembly shall be copper alloy, ferrous, and insulating materials with ends matching piping system.

B. Dielectric Unions: Factory-fabricated assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material that isolates dissimilar materials and ends with inside threads according to ASME B1.20.1.
   1. Manufacturers:
      a. Watts Industries, Inc.; Water Products Div.
      b. Zurn Industries, Inc.; Wilkins Div.
      c. Or equal.

2.5 CORROSION-PROTECTIVE ENCASEMENT FOR PIPING

A. Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch minimum thickness, tube or sheet.

2.6 SPRINKLER SPECIALTY FITTINGS

A. Sprinkler specialty fittings shall be UL listed or FMG approved, with 175-psig minimum working-pressure rating, and made of materials compatible with piping. Sprinkler specialty fittings shall have 250-psig minimum working-pressure rating if fittings are components of high-pressure piping system.

B. Outlet Specialty Fittings:
   1. Manufacturers:
      a. Anvil International, Inc.
      b. Central Sprinkler Corp.
      c. Victaulic Co. of America.
      d. Or equal.
   2. Mechanical-T and -Cross Fittings: UL 213, ductile-iron housing with gaskets, bolts and nuts, and threaded, locking-lug, or grooved outlets.
   3. Snap-On and Strapless Outlet Fittings: UL 213, ductile-iron housing or casting with gasket and threaded outlet.

C. Sprinkler Drain and Alarm Test Fittings: Cast- or ductile-iron body; with threaded or locking-lug inlet and outlet, test valve, and orifice and sight glass.
   1. Manufacturers:
      a. Central Sprinkler Corp.
      b. Viking Corp.
      c. Victaulic Co. of America.
      d. Or equal.

D. Sprinkler Branch-Line Test Fittings: Brass body with threaded inlet, capped drain outlet, and threaded outlet for sprinkler.
   1. Manufacturers:
      a. Elkhart Brass Mfg. Co., Inc.
      b. Fire-End and Croker Corp.

c. Potter-Roemer; Fire-Protection Div.
d. Or equal.

E. Sprinkler Inspector's Test Fitting: Cast- or ductile-iron housing with threaded inlet and drain outlet and sight glass.
1. Manufacturers:
a. AGF Manufacturing Co.
b. Central Sprinkler Corp.
c. Triple R Specialty of Ajax, Inc.
d. Or equal.

F. Drop-Nipple Fittings: UL 1474, adjustable with threaded inlet and outlet, and seals.
1. Manufacturers:
a. CECA, LLC.
b. Merit.
c. Or equal.

2.7 LISTED FIRE-PROTECTION VALVES

A. Valves shall be UL listed or FMG approved, with 175-psig minimum pressure rating. Valves shall have 250-psig minimum pressure rating if valves are components of high-pressure piping system.

B. Gate Valves with Wall Indicator Posts:
1. Gate Valves: UL 262, cast-iron body, bronze mounted, with solid disc, nonrising stem, operating nut, and flanged ends.
2. Indicator Posts: UL 789, horizontal-wall type, cast-iron body, with operating wrench, extension rod, locking device, and cast-iron barrel.
3. Manufacturers:
a. Grinnell Fire Protection.
b. McWane, Inc.; Kennedy Valve Div.
c. NIBCO.
d. Stockham.
e. Or equal.

C. Ball Valves: Comply with UL 1091, except with ball instead of disc.
1. NPS 1-1/2 and Smaller: Bronze body with threaded ends.
2. NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
3. NPS 3: Ductile-iron body with grooved ends.
4. Manufacturers:
a. NIBCO.
b. Victaulic Co. of America.
c. Or equal.

D. Butterfly Valves: UL 1091.
1. NPS 6 and Smaller: Bronze body with threaded ends.
a. Manufacturers:
1) Global Safety Products, Inc.

2) Milwaukee Valve Company.
3) Or equal.

E. Check Valves NPS 2 and Larger: UL 312, swing type, cast-iron body with flanged or grooved ends.
1. Manufacturers:
a. American Cast Iron Pipe Co.; Waterous Co.
b. Central Sprinkler Corp.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Victaulic Co. of America.
e. Watts Industries, Inc.; Water Products Div.
f. Or equal.

F. Gate Valves: UL 262, OS&Y type.
1. NPS 6 and Smaller: Bronze body with threaded ends.
a. Manufacturers:
1) Crane Co.; Crane Valve Group; Crane Valves.
2) Hammond Valve.
3) NIBCO.
4) Or equal.

G. Indicating Valves: UL 1091, with integral indicating device and ends matching connecting piping.
1. Indicator: Electrical, 115-V ac, prewired, 2-circuit, supervisory switch Visual.
2. NPS 2 and Smaller: Ball or butterfly valve with bronze body and threaded ends.
a. Manufacturers:
1) Milwaukee Valve Company.
2) NIBCO.
3) Victaulic Co. of America.
4) Or equal.
3. NPS 2-1/2 and Larger: Butterfly valve with cast- or ductile-iron body; wafer type or with flanged or grooved ends.
a. Manufacturers:
1) Milwaukee Valve Company.
2) NIBCO.
3) Victaulic Co. of America.
4) Or equal.

2.8 UNLISTED GENERAL-DUTY VALVES

A. Ball Valves NPS 2 and Smaller: MSS SP-110, 2-piece copper-alloy body with chrome-plated brass ball, 600-psig minimum CWP rating, blowout-proof stem, and threaded ends.

B. Check Valves NPS 2 and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.

C. Gate Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, solid wedge, and threaded ends.

D. Globe Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

2.9 SPECIALTY VALVES

A. Sprinkler System Control Valves: UL listed or FMG approved, cast- or ductile-iron body with flanged or grooved ends, and 175-psig minimum pressure rating. Control valves shall have 300-psig pressure rating if valves are components of high-pressure piping system.
   1. Manufacturers:
      a. Central Sprinkler Corp.
      b. Reliable Automatic Sprinkler Co., Inc.
      c. Victaulic Co. of America.
      d. Or equal.
   2. Alarm Check Valves: UL 193, designed for horizontal or vertical installation, with bronze grooved seat with O-ring seals, single-hinge pin, and latch design. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
      a. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
      b. Drip Cup Assembly: Pipe drain with check valve to main drain piping.
   3. Dry-Pipe Valves: UL 260, differential type; with bronze seat with O-ring seals, single-hinge pin, and latch design. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
      a. Air-Pressure Maintenance Device: UL 260, automatic device to maintain correct air pressure in piping. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig maximum inlet pressure.
         1) Manufacturers:
            a) AFAC Inc.
            b) Central Sprinkler Corp.
            c) Reliable Automatic Sprinkler Co., Inc.
            d) Viking Corp.
            e) Or equal.

2.10 SPRINKLERS

A. Sprinklers shall be UL listed or FMG approved, with 175-psig minimum pressure rating. Sprinklers shall have 250-psig minimum pressure rating if sprinklers are components of high-pressure piping system.

B. Manufacturers:
   1. Central Sprinkler Corp.
   2. Reliable Automatic Sprinkler Co., Inc.
   3. Star Sprinkler Inc.

C. Automatic Sprinklers: With heat-responsive element complying with the following:
   1. UL 199, for nonresidential applications.

2. UL 1626, for residential applications.
3. UL 1767, for early-suppression, fast-response applications.

D. Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.
1. Open Sprinklers: UL 199, without heat-responsive element.
   a. Orifice: 1/2 inch, with discharge coefficient K between 5.3 and 5.8.
   b. Orifice: 17/32 inch, with discharge coefficient K between 7.4 and 8.2.

E. Sprinkler types, features, and options as follows:
1. Concealed ceiling sprinklers, including cover plate.
2. Extended-coverage sprinklers.
3. Flow-control sprinklers, with automatic open and shutoff feature.
4. Flush ceiling sprinklers, including escutcheon.
5. Pendent sprinklers.
6. Pendent, dry-type sprinklers.
7. Recessed sprinklers, including escutcheon.
8. Sidewall sprinklers.
9. Upright sprinklers.

F. Sprinkler Finishes: Chrome plated, bronze, and painted.

G. Special Coatings: Wax, lead, and corrosion-resistant paint.

H. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
1. Ceiling Mounting: Chrome-plated steel, 2 piece, with 1-inch vertical adjustment.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

I. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

2.11 FIRE DEPARTMENT CONNECTIONS

A. Manufacturers:
1. Central Sprinkler Corp.
2. Elkhart Brass Mfg. Co., Inc.
3. Potter-Roemer; Fire-Protection Div.

B. Wall-Type, Fire Department Connection: UL 405, 175-psig minimum pressure rating; with corrosion-resistant-metal body with brass inlets, brass wall escutcheon plate, brass lugged caps with gaskets and brass chains, and brass lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking similar to "AUTO SPKR & STANDPIPE."
1. Type: Flush, with two inlets and square or rectangular escutcheon plate.
2. Type: Exposed, projecting, with two inlets and round escutcheon plate.
3. Finish: Rough chrome-plated Polished brass.

C. Exposed, Freestanding-Type, Fire Department Connection: UL 405, 300-psig pressure rating; with corrosion-resistant-metal body, brass inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, and bottom outlet with pipe threads. Include brass lugged caps, gaskets, and brass chains; brass lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch- high, brass sleeve; and round, floor, brass escutcheon plate with marking "AUTO SPKR & STANDPIPE."
   1. Finish Including Sleeve: Rough chrome-plated Polished brass.

2.12 ALARM DEVICES

A. Electrically Operated Alarm: UL 464, with 10-inch- diameter, vibrating-type, metal alarm bell with red-enamel factory finish and suitable for outdoor use.
   1. Manufacturers:
      a. Potter Electric Signal Company.
      b. System Sensor.
      c. Or equal.

B. Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 250-psig pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
   1. Manufacturers:
      a. Grinnell Fire Protection.
      b. ITT McDonnell & Miller.
      c. Potter Electric Signal Company.
      d. Or equal.

C. Pressure Switch: UL 753, electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.
   1. Manufacturers:
      a. Grinnell Fire Protection.
      b. Potter Electric Signal Company.
      c. System Sensor.
      d. Viking Corp.
      e. Or equal.

D. Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position.
   1. Manufacturers:
      a. McWane, Inc.; Kennedy Valve Div.
      b. Potter Electric Signal Company.
      c. System Sensor.
      d. Or equal.

E. Indicator-Post Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.
   1. Manufacturers:

a. Potter Electric Signal Company.
b. System Sensor.
c. Or equal.

2.13 PRESSURE GAGES

A. Manufacturers:
1. AGF Manufacturing Co.
2. Marsh Bellofram.
3. WIKA Instrument Corporation.
4. Or equal.

B. Description: UL 393, 3-1/2- to 4-1/2-inch- diameter, dial pressure gage with range of 0 to 300 psig.
1. Water System Piping: Include caption "WATER" or "AIR/WATER" on dial face.
2. Air System Piping: Include retard feature and caption "AIR" or "AIR/WATER" on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13, NFPA 14, and NFPA 291. Use results for system design calculations required in Part 1 "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PIPING APPLICATIONS, GENERAL

A. Shop weld pipe joints where welded piping is indicated.

B. Do not use welded joints for galvanized-steel pipe.

C. Flanges, flanged fittings, unions, nipples, and transition and special fittings with finish and pressure ratings same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.

D. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.

E. Underground Service-Entrance Piping: Ductile-iron, mechanical-joint pipe and fittings and restrained joints. Include corrosion-protective encasement.

F. Underground Service-Entrance Piping: Ductile-iron, grooved-end pipe and fittings; grooved-end-pipe couplings; and grooved joints. Include corrosion-protective encasement.

3.4 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Listed Fire-Protection Valves: UL listed and FMG approved for applications where required by NFPA 13 and NFPA 14.
      a. Shutoff Duty: Use ball, butterfly, or gate valves.
   2. Unlisted General-Duty Valves: For applications where UL-listed and FMG-approved valves are not required by NFPA 13 and NFPA 14.
      a. Shutoff Duty: Use ball, butterfly, or gate valves.
      b. Throttling Duty: Use ball or globe valves.

3.5 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

N. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

O. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

P. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.

Q. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

R. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

S. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

3.6 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression piping to water-service piping of size and in location indicated for service entrance to building.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.7 WATER-SUPPLY CONNECTION

A. Connect fire-suppression piping to building's interior water distribution piping. Refer to Division 22 Section "Domestic Water Piping" for interior piping.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water distribution piping.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.8 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
   1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

N. Fill sprinkler system piping with water.

O. Install sleeves for piping penetrations of walls, ceilings, and floors.

P. Install sleeve seals for piping penetrations of concrete walls and slabs.

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.9 VALVE INSTALLATION

A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim, controls, and specialties according to NFPA 13 and NFPA 14 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Valves for Wall-Type Fire Hydrants: Install nonrising-stem gate valve in water-supply pipe.

D. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water supply sources.

E. Specialty Valves:
   1. Alarm Check Valves: Install in vertical position for proper direction of flow, including bypass check valve and retarding chamber drain-line connection.
   2. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
      a. Air-Pressure Maintenance Devices for Dry-Pipe Systems: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig adjustable range; and 175-psig maximum inlet pressure.
      b. Install air compressor and compressed-air supply piping.
      c. Install compressed-air supply piping from building's compressed-air piping system.

3.10 SPRINKLER APPLICATIONS

A. Drawings indicate sprinkler types to be used. Where specific types are not indicated, use the following sprinkler types:
   1. Rooms without Ceilings: Upright sprinklers.
   2. Rooms with Suspended Ceilings: Semi-Recessed sprinklers Concealed sprinklers Pendent, recessed, flush, and concealed sprinklers, as indicated.
   3. Wall Mounting: Sidewall sprinklers.
   4. Special Applications: Extended-coverage, flow-control, and quick-response sprinklers.
   5. Sprinkler Finishes:
      a. Upright, Pendent, and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.
      b. Semi-Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.

3.11 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels and tiles.

B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.

3.12 MONITOR INSTALLATION

A. Install monitor bases securely attached to building substrate.

3.13 FIRE HYDRANT INSTALLATION

A. Install fire hydrants mounted in vertical wall with shutoff valve inside building in heated space.

3.14 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire department connections in vertical wall.

B. Install freestanding-type, fire department connections in level surface.
   1. Install protective pipe bollards on three sides of each fire department connection. Refer to Division 5 Section "Metal Fabrications" for pipe bollards.

C. Install ball drip valve at each check valve for fire department connection.

3.15 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Connect water-supply piping to fire-suppression piping. Include backflow preventer between potable-water piping and fire-suppression piping. Refer to Division 22 Sections for backflow preventers.

D. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.

E. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.

F. Electrical Connections: Power wiring is specified in Division 26.

G. Connect alarm devices to fire alarm.

H. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.16 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 NFPA 13 and NFPA 14 NFPA 14 and in Division 23 Section "Identification for HVAC Piping and Equipment."

3.17 FIELD QUALITY CONTROL

A. 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. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Energize circuits to electrical equipment and devices.
4. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
5. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
6. Coordinate with fire alarm tests. Operate as required.
7. Coordinate with fire-pump tests. Operate as required.
8. Verify that equipment hose threads are same as local fire department equipment.

B. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.18 CLEANING AND PROTECTION

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

C. Protect sprinklers from damage until Substantial Completion.

3.19 DEMONSTRATION

A. Engage a factory-authorized service representative to train State's maintenance personnel to adjust, operate, and maintain specialty valves.

* End Division 21 *

Division 22 - PLUMBING

ESCUTCHEONS FOR PLUMBING PIPING Section 22 05 18

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
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.

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.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

HANGERS & SUPPORTS FOR PLUMBING PIPING & EQUIPMENT — Section 22 05 29

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment 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 plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes, 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. Metal framing systems.
   3. Fiberglass strut systems.
   4. Pipe stands.
   5. 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 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 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 stainless 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 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Unistrut Corporation; Tyco International, Ltd.
   b. Cooper B-Line, Inc.
   c. Or approved equal.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
7. Metallic Coating: Hot-dipped galvanized.
8. Paint Coating: Epoxy.
9. Plastic Coating: Epoxy.

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, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe.

2.6 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.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 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 (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Fastener System Installation:
   1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

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 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:
1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
   c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
   d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
   e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. 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 (40 mm).

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 (0.05 mm).

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 stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

F. Use padded hangers for piping that is subject to scratching.

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 (DN 15 to DN 750).
   2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
   3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
   4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
   5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
   6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
   7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
   8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
   9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
   10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
   11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
   12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
   13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

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 (DN 24 to DN 600).
   2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
   2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
   3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
   4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
   5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

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 (32 mm).
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. 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.
6. 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.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include

auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

a. Horizontal (MSS Type 54): Mounted horizontally.
b. Vertical (MSS Type 55): Mounted vertically.
c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT — Section 22 05 53

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Valve tags.

1.3 ACTION SUBMITTALS

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch (0.64-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm)high.

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.

1. Tag Material: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) 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 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. 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 (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Domestic Water Piping:

a. Background Color: Green.
b. Letter Color: White.

3.4 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 (38 mm), round.

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

PLUMBING PIPING INSULATION Section 22 07 19

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Sanitary waste piping exposed to freezing conditions.

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 attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Preformed Pipe Insulation Materials: 12 inches (300 mm) long by NPS 2 (DN 50).
2. Jacket Materials for Pipe: 12 inches (300 mm) long by NPS 2 (DN 50).
3. Sheet Jacket Materials: 12 inches (300 mm) square.
4. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

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.

C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

1. Piping Mockups:

a. One 10-foot (3-m) section of NPS 2 (DN 50) straight pipe.
b. One each of a 90-degree threaded, welded, and flanged elbow.
c. One each of a threaded, welded, and flanged tee fitting.
d. One NPS 2 (DN 50) or smaller valve, and one NPS 2-1/2 (DN 65) or larger valve.
e. Four support hangers including hanger shield and insert.
f. One threaded strainer and one flanged strainer with removable portion of insulation.
g. One threaded reducer and one welded reducer.
h. One pressure temperature tap.
i. One mechanical coupling.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Obtain Architect's approval of mockups before starting insulation application.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.

D. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

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 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 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 "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. 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, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following :

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 Deg F (454 Deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Ramco Insulation, Inc.; Super-Stik.
b. Or approved equal.

2.3 ADHESIVES

A. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, 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; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

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."

2.4 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.5 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide the following provide one of the following:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping and Seals.
c. Or approved equal.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) wide with closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils (0.127 mm) thick and an epoxy finish 5 mils (0.127 mm) thick if operating in a temperature range between 140 and 300 deg F (60 and 149 deg C). 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 (0 and 149 deg C) 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 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.

C. Install insulation with longitudinal seams at top and bottom of horizontal runs.

D. Install multiple layers of insulation with longitudinal and end seams staggered.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). 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 (50 mm) 4 inches (100 mm) 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.

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 (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

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 (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.

4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.8 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.

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. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. 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.

3.11 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Domestic Water Piping:

1. All Pipe Sizes: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches (50 mm) thick.

3.12 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed:
1. Stainless Steel, Type 304 or Type 316, Corrugated with Z-Shaped Locking Seam: 0.010 inch (0.25 mm) 0.016 inch (0.41 mm) 0.020 inch (0.51 mm) 0.024 inch (0.61 mm) thick.

3.13 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION

DOMESTIC WATER PIPING Section 22 11 16

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes domestic water piping inside the building.

B. Related Sections include the following:

1. Division 01 Sustainable Design Requirements – LEED Sections.
2. Division 22 Sections for water distribution piping specialties.

1.3 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Water Samples: Specified in Part 3 "Cleaning" Article.

D. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.

C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.3 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
4. Copper, Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.

a. Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

2.4 PE ENCASEMENT

A. PE Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105 PE film, 0.008-inch minimum thickness, tube or sheet.

2.5 VALVES

A. Refer to Division 23 Section 230523 "General-Duty Valves for HVAC Piping" for bronze and cast-iron, general duty valve.

B. Refer to Division 22 Sections for balancing and drain valves.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.2 PIPE AND FITTING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

E. Aboveground Domestic Water Piping: Use the following piping materials for each size range:

1. NPS 1-1/2 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
2. NPS 2 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

F. Underground Domestic Water Service Piping: Use the following piping materials for each size range.

1. NPS 2 and Smaller: Soft Copper Tube, Type K; copper pressure fittings; and brazed joints.
2. NPS 2-1/2 to NPS 3-1/2: Soft copper tube: Type K; copper pressure fitting; and brazed joints.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball valves for piping NPS 2 and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use ductile-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.

3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

3.4 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 under-building-slab copper tubing according to CDA's "Copper Tube Handbook."

C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 23 Section "Basic Mechanical Materials and Methods."

D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 23 Section "Basic Mechanical Materials and Methods."

E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Drain valves and strainers are specified in Division 22 Sections.

F. Install water-pressure regulators downstream from shutoff valves. Water-pressure regulators are specified in Division 22 Sections.

G. Install domestic water piping level and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

J. 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.

K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

L. Install piping to permit valve servicing.

M. Install piping free of sags and bends.

3.5 JOINT CONSTRUCTION

A. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.6 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

B. Pipe hanger and support devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

    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: MSS Type 49, spring cushion rolls, if indicated.

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. Install supports according to Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.

F. 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.

G. Install supports for vertical steel piping every 15 feet.

H. 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.

I. Install supports for vertical copper tubing every 10 feet.

J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve, and extend and connect to the following:

1. Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Sections for Plumbing Fixtures.
4. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. 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 domestic water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm 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. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

DOMESTIC WATER PIPING SPECIALTIES Section 22 11 19

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Balancing valves.
3. Strainers.
4. Hose bibbs.
5. Wall hydrants.
6. Post hydrants.
7. Drain valves.
8. Water hammer arresters.
9. Trap-seal primer valves.

B. Related Sections include the following:

1. Division 01 Sustainable Design Requirements – LEED Sections.
2. Division 22 Section "Domestic Water Piping" for water meters.
3. Division 22 Sections for water filters for water coolers.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

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

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Rain Bird Corporation.
b. Toro Company (The); Irrigation Div.
c. Watts Industries, Inc.; Water Products Div.
d. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: As required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. MIFAB, Inc.
b. Watts Industries, Inc.; Water Products Div.
c. Zurn Plumbing Products Group; Light Commercial Operation.

2. Standard: ASSE 1011.
3. Body: Bronze, non-removable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

2.2 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Watts Industries, Inc.; Water Products Div.
   b. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 125 psig.
4. Design Inlet Pressure: 125-psig minimum.
5. Design Outlet Pressure Setting: 125-psig minimum.
6. Body: Bronze 4 inch for and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for 6 inch and larger.
7. End Connections: Threaded for and smaller; flanged for.

B. Water Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CLA-VAL Automatic Control Valves.
   b. Flomatic Corporation.
   c. OCV Control Valves.
   d. Watts Industries, Inc.; Ames Fluid Control Systems.
   e. Watts Industries, Inc.; Watts ACV.
   f. Zurn Plumbing Products Group; Wilkins Div.

2. Description: Pilot-operation, diaphragm-type, single-seated main water control valve.
3. Pressure Rating: Initial working pressure of minimum with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.
4. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.
5. End Connections: Threaded for 2 inch and smaller; flanged for 2 ½ inch and larger.

2.3 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. NIBCO INC.
   b. Taco, Inc.
   c. Watts Industries, Inc.; Water Products Div.

2. Type: Y-pattern globe valve with two readout ports and memory setting indicator.
3. Body: Bronze.
4. Size: Same as connected piping, but not larger than.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2.4 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: minimum, unless otherwise indicated.
2. Body: Bronze for 2 inch and smaller; ductile iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for 2 ½ inch and larger.
3. End Connections: Threaded for 2 inch and smaller; flanged for 2 ½ inch and larger.
4. Screen: Stainless steel with rounds perforations, unless otherwise indicated.
5. Perforation Size:

    a. Manufacturer standard.

6. Drain: Pipe plug.

2.5 HOSE BIBBS

A. Hose Bibbs HB-1:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating:
7. Vacuum Breaker: Integral, non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel-plated.
9. Finish for Service Areas: Chrome or nickel-plated.
10. Finish for Finished Rooms: Chrome or nickel-plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.6 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: minimum CWP.
3. Body: Copper alloy.
4. Ball: Chrome-plated brass.
5. Seats and Seals: Replaceable.
6. Handle: Vinyl-covered steel.
7. Inlet: Threaded or solder joint.
8. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.7 WATER HAMMER ARRESTERS

A. Water Hammer Arresters (WHA):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.8 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. MIFAB, Inc.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

2. Standard: ASSE 1018.
3. Pressure Rating: minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in 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.

B. Do not install bypass piping around backflow preventers.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install water hammer arresters in water piping according to PDI-WH 201.

E. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Pressure vacuum breakers.
2. Calibrated balancing valves.
3. Outlet boxes.
4. Hose stations.
5. 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 Division 23 Section "Identification for HVAC Piping and Equipment."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer, double-check backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.4 ADJUSTING

A. Set field-adjustable flow set points of balancing valves.

END OF SECTION

SANITARY WASTE AND VENT PIPING Section 22 13 16

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

B. Related Sections include the following:

1. Division 01 Sustainable Design Requirements – LEED Sections.

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 be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.4 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings:

1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.

D. Field quality-control inspection and test reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Heavy Duty, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; 4 stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) Husky.

2.4 PE ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Description: ASTM A 674 or AWWA C105, metal piping, cross-laminated PE film of 0.008-inch minimum thickness.

2.5 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer 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. Solvent Cement: ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Solvent cement 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."

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 02 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range.

1. NPS 1-1/4 and NPS 1-1/2: Use NPS 1-1/2 hubless, cast-iron soil piping and one of the following:

   a. Couplings: Heavy-duty, Type 301, stainless steel.

2. NPS 1-1/2 to NPS 4: Hubless, cast-iron soil piping and one of the following:

   a. Couplings: Heavy-duty, Type 301, stainless steel.

3. NPS 5 and Larger: Hubless, cast-iron soil piping and one of the following:

   a. Couplings: Heavy-duty, Type 301, stainless steel.

C. Underground, Soil, Waste, and Vent Piping: Use the following piping materials for each size ranger:

1. NPS 1-1/2: Hubless, cast-iron soil piping and one of the following:

   a. Couplings: Heavy-duty, Type 301, stainless steel.

2. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:

a. Couplings: Heavy-duty, Type 301, stainless steel.

3. NPS 5 and Larger: Hubless, cast-iron soil piping and one of the following:

a. Couplings: Heavy-duty, Type 301, stainless steel.

D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

3.3 PIPING INSTALLATION

A. Sanitary sewer piping outside the building is specified in Division 02 Sections.

B. Install seismic restraints on piping. Seismic-restraint devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 23 Section "Basic Mechanical Materials and Methods."

F. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.

G. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

H. 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 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

I. 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.

J. 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 and smaller; 1 percent downward in direction of flow for piping 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.

K. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

L. Install underground soil and waste drainage piping according to ASTM D 2321.

M. Install underground PVC piping according to ASTM D 2321.

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

B. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 23 Section "General-Duty Valves for HVAC Piping and Equipment."

B. Shutoff Valves: Install shutoff valve on each sewage pump discharge.

1. Install gate or full-port ball valve for piping and smaller.
2. Install gate valve for piping and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.6 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 23 Section "Vibration and Seismic Controls and Seismic Restraints for HVAC Piping and Equipment."

B. Pipe hangers and supports are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

a. and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than: MSS Type 43, adjustable roller hangers.
c. Longer Than, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: Go inches with 3/8-inch rod.
2. NPS 3: Go inches with 1/2-inch rod.
3. NPS 4 and NPS 5: Go inches with 5/8-inch rod.
4. NPS 6: Go inches with 3/4-inch rod.
5. NPS 8: Go inches with 3/4-inch rod.

G. Install supports for vertical cast-iron soil piping every.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections and larger.

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Contractor to pressure jet storm drains and sewers at the end of construction, prior to occupancy to insure that they are free of any construction debris, then contractor shall video tape sewers and storm drains to verify alignment, full and drainage. Video tape must show a wet run water test with inspector present.
7. Prepare reports for tests and required corrective action.

E. Contractor shall provide services to video the condition of all new underground sanitary sewer pipe installation at two separate time periods during construction with representatives of the university present. Coordinate scheduling with the university.

3.9 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PROTECTION

A. Exposed Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION

SANITARY WASTE PIPING SPECIALTIES Section 22 13 19

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following drainage piping specialties:
1. Cleanouts.
2. Floor drains.
3. Through-penetration firestop assemblies.
4. Roof drains.
5. Miscellaneous drainage piping specialties.
6. Flashing materials.
7. Sand-Oil interceptors

B. Related Sections include the following:

1.3 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.

1. Wiring Diagrams: Power, signal, and control wiring.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary and storm piping specialty components.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Metal Floor Cleanouts (FCO):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products Group; Light Commercial Operation.

2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Threaded.
8. Closure: Brass plug with straight threads and gasket.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Polished bronze.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
14. Standard: ASME A112.3.1.
15. Size: Same as connected branch.
16. Housing: Stainless steel.
17. Closure: Stainless steel with seal.
18. Riser: Stainless-steel drainage pipe fitting to cleanout.

B. Cast-Iron Wall Cleanouts (WCO):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Drilled-and-threaded plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains (FD-1):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products Group; Light Commercial Operation.

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom.
9. Backwater Valve: Drain-outlet type.
10. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
11. Sediment Bucket: Not required.
12. Top or Strainer Material: Nickel bronze.
13. Top of Body and Strainer Finish: Nickel bronze.
14. Top Shape: Round.
15. Dimensions of Top or Strainer: 5" Diameter Strainer.
16. Top Loading Classification: Heavy Duty.
17. Funnel: Not required.
18. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
19. Trap Material: Cast iron.
20. Trap Pattern: Standard P-trap.
21. Trap Features: Trap-seal primer valve drain connection.

2.3 ROOF DRAINS

A. Metal Roof Drains (RD-1):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.2M.
3. Pattern: Roof drain.
4. Body Material: Cast iron.
5. Dimensions of Body:

6. Combination Flashing Ring and Gravel Stop: Required.
7. Flow-Control Weirs: Not required.
8. Outlet: Bottom.
9. Dome Material: Cast iron.
10. Extension Collars: Not required.
11. Underdeck Clamp: Required.
12. Sump Receiver: Required.

2.4 OVERFLOW ROOF DRAINS

A. Roof drains, (ORD-1): Comply with ASME A112.21.2M ASME A112.3.1.

1. Application: Overflow roof drain.
2. Products:

    a. Smith, Jay R. Mfg. Co.; Fig. 1080.
    b. Josam Co.; Model No. 21500.
    c. Zurn Industries, Inc., Jonespec Div., Model No. Z-100-89.

3. Body Material: Cast iron.
4. Combination Flashing Ring and Gravel Stop: Rquired.
5. Outlet: Bottom.
6. Dome Material: Cast iron.
7. Extension Collars: Required.
8. Underdeck Clamp: Required.
9. Sump Receiver: Required.

2.5 MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. 2-inch minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with side inlet.

D. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

E. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2: Size: Same as connected stack vent or vent stack.

F. Downspout Boots:

1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; outlet; and shop-applied bituminous coating.
2. Size: Inlet size to match downspout.
3. Description: ASTM A 74, Service class, hub-and-spigot, cast-iron soil pipe.
4. Size: Same as or larger than connected downspout.

G. Conductor Nozzles:

1. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.
2. Size: Same as connected conductor.

2.6 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: , thickness.
2. Vent Pipe Flashing: , thickness.
3. Burning: , thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications:
2. Vent Pipe Flashing:

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and minimum thickness, unless otherwise indicated. Include hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.7 SAND OIL INTERCEPTORS

A. Sand Oil Interceptors SOI-1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Jensen Precast.
   b. Or approved equal.

2. Type: Factory-fabricated interceptor for separating and removing sand and oil from wastewater.
3. Body Material: Concrete.
4. Interior Lining: Corrosion-resistant enamel.
5. Exterior Coating: Not required.
6. Body Dimensions: 11ft 6 inches by 6 ft 0 inches by 5 ft 7 inches high.
7. Inlet and Outlet Size: 6-inch.
8. End Connections: Hub.
9. Mounting: Above floor.
10. Flow-Control Fitting: Not required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to. Use for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of for piping and smaller and for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, or Less: Equivalent to 1 percent slope, but not less than total depression.
b. Radius,: Equivalent to 1 percent slope.
c. Radius, or Larger: Equivalent to 1 percent slope, but not greater than total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

F. Install roof-flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Install through-penetration firestop assemblies in all conductors and stacks at floor penetrations.

I. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Division 07.

1. Install roof-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

J. Assemble open drain fittings and install with top of hub 18 inches (minimum) above floor.

K. Install deep-seal traps on floor drains and other waste outlets, if indicated.

L. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

M. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

N. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

O. Install vent caps on each vent pipe passing through roof.

P. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain clearance between vent pipe and roof substrate.

Q. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

R. Install cast-iron soil pipe downspout boots at grade with top of hub 6" above grade.

S. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.

T. Install frost-proof vent caps on each vent pipe passing through roof. Maintain clearance between vent pipe and roof substrate.

U. Install wood-blocking reinforcement for wall-mounting-type specialties.

V. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

W. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipefittings.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets, thickness or thicker. Solder joints of lead sheets, thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of, and skirt or flange extending at least around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counter-flashing or commercially made flashing fittings.

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

FACILITY STORM DRAINAGE PIPING Section 22 14 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following storm drainage piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipefittings.
3. Encasement for underground metal piping.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:

1. Storm Drainage Piping: 10 foot head of water.

1.4 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings:

1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.
2. Controlled-Flow Storm Drainage System: Include calculations, plans, and details.

D. Field quality-control inspection and test reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Couplings: ASTME C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral center pipe stop.

1. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.

a. NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.
b. NPS 5 to NPS 10: 4-inch- wide shield with 6 bands.

2.4 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Description: ASTM A 674 or AWWA C105, PE film of 0.008-inch minimum thickness.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground storm drainage piping NPS 2 to NPS 8 shall be the following:

1. Hubless cast-iron soil pipe and fittings; heavy duty, shielded, stainless-steel couplings; and coupled joints.

C. Underground storm drainage piping NPS 2 to NPS 8 shall be the following:

1. Hubless cast-iron soil pipe and fittings; heavy duty, shielded, stainless-steel couplings; and coupled joints.

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 from layout are approved on coordination drawings.

B. Install seismic restraints on piping. Seismic-restraint devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers. Cleanouts are specified in Division 22 Section "Sanitary Waste Piping Specialties."

A. 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."

B. Install wall-penetration fitting system at each service pipe penetration through foundation wall. Make installation watertight.

C. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

D. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. 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.

E. Lay buried building storm 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.

F. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm Drain: 2 percent downward in direction of flow.
2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

H. Install underground storm drainage piping according to ASTM D 2321.

I. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

3.4 VALVE INSTALLATION

A. Shutoff Valves: Install shutoff valve on each sump pump discharge.

1. Install gate or full-port ball valve for piping and smaller.
2. Install gate valve for piping and larger.

B. Check Valves: Install swing check valve, between pump and shutoff valve, on each sump pump discharge.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

   a. (x)and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than (x): MSS Type 43, adjustable roller hangers.

3. Multiple, Straight, Horizontal Piping Runs or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3: 60 inches with ½-inch rod.
2. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
3. NPS 6: 60 inches with ¾-inch rod.
4. Spacing for 10 foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.
6. Contractor to pressure jet storm drains and sewers at the end of construction, prior to occupancy to insure that they are free of any construction debris, then contractor shall video tape sewers and storm drains to verify alignment, full and drainage. Video tape must show a wet run water test with inspector present.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

GENERAL-SERVICE COMPRESSED-AIR PIPING Section 22 15 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes piping and related specialties for general-service compressed-air systems operating at 200 psig (1380 kPa) or less.

B. Related Sections include the following:

1. Section 221519 "General-Service Packaged Air Compressors and Receivers" for general-service air compressors and accessories.

1.3 DEFINITIONS

A. High-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures between 150 and 200 psig (1035 and 1380 kPa).

B. Low-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of 150 psig (1035 kPa) or less.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Compressed-air piping and support and installation shall withstand effects of seismic events determined according to SEI/ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Plastic pipes, fittings, and valves.
2. Dielectric fittings.
3. Flexible pipe connectors.
4. Safety valves.
5. Pressure regulators. Include rated capacities and operating characteristics.
6. Automatic drain valves.
7. Filters. Include rated capacities and operating characteristics.
8. Lubricators. Include rated capacities and operating characteristics.

9. Quick couplings.
10. Hose assemblies.

1.6 INFORMATIONAL SUBMITTALS

A. Brazing and welding certificates.

B. Qualification Data: For Installers.

C. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For general-service compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Extruded-Tee Outlet Procedure: Qualify operators according to training provided by T-DRILL Industries Inc., for making branch outlets.
2. Pressure-Seal Joining Procedure for Copper Tubing: Qualify operators according to training provided by Viega; Plumbing and Heating Systems.
3. Pressure-Seal Joining Procedure for Steel Piping. Qualify operators according to training provided by Victaulic Company.

B. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications," or to AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

D. ASME Compliance:

1. Comply with ASME B31.1, "Power Piping," for high-pressure compressed-air piping.
2. Comply with ASME B31.9, "Building Services Piping," for low-pressure compressed-air piping.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Schedule 40, Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B, black or hot-dip zinc coated with ends threaded according to ASME B1.20.1.

1. Steel Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized seamless steel pipe. Include ends matching joining method.

2. Malleable-Iron Fittings: ASME B16.3, Class 150 or 300, threaded.
3. Malleable-Iron Unions: ASME B16.39, Class 150 or 300, threaded.
4. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel, threaded.
5. Wrought-Steel Butt-Welding Fittings: ASME B16.9, Schedule 40.
6. Steel Flanges: ASME B16.5, Class 150 or 300, carbon steel.
7. Grooved-End Fittings and Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Anvil International, Inc.
        2) Star Pipe Products; Star Fittings Div.
        3) Victaulic Company.
        4) Ward Manufacturing, Inc.

    b. Grooved-End Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron casting; with grooves according to AWWA C606 and dimensions matching steel pipe.
    c. Couplings: AWWA C606 or UL 213, for steel-pipe dimensions and rated for 300-psig (2070-kPa) minimum working pressure. Include ferrous housing sections, gasket suitable for compressed air, and bolts and nuts. Provide EDPM gaskets for oil-free compressed air. Provide NBR gaskets if compressed air contains oil or oil vapor.

B. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B) seamless, drawn-temper, water tube.

1. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type or MSS SP-73, wrought copper with dimensions for brazed joints.
2. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300.
3. Copper Unions: ASME B16.22 or MSS SP-123.

2.2 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for compressed-air piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

2.3 VALVES

A. Metal Ball, Butterfly, Check, Gate, and Globe Valves: Comply with requirements in Section 220523 "General-Duty Valves for Plumbing Piping."

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. McDonald, A. Y. Mfg. Co.
b. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
c. Wilkins; a Zurn company.

2. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 150 psig (1035 kPa).
c. End Connections: Solder-joint copper alloy and threaded ferrous.

2.5 SPECIALTIES

A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.

1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.

B. Air-Main Pressure Regulators: Bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 250-psig (1725-kPa) inlet pressure, unless otherwise indicated.

1. Type: Pilot operated.

C. Air-Line Pressure Regulators: Diaphragm or pilot operated, bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig (1380-kPa) minimum inlet pressure, unless otherwise indicated.

D. Automatic Drain Valves: Stainless-steel body and internal parts, rated for 200-psig (1380-kPa) minimum working pressure, capable of automatic discharge of collected condensate. Include mounting bracket if wall mounting is indicated.

E. Coalescing Filters: Coalescing type with activated carbon capable of removing water and oil aerosols; with color-change dye to indicate when carbon is saturated and warning light to indicate when selected maximum pressure drop has been exceeded. Include mounting bracket if wall mounting is indicated.

F. Air-Line Lubricators: With drip chamber and sight dome for observing oil drop entering air stream; with oil-feed adjustment screw and quick-release collar for easy bowl removal. Include mounting bracket if wall mounting is indicated.

1. Provide with automatic feed device for supplying oil to lubricator.

2.6 QUICK COUPLINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aeroquip Corporation; Eaton Corp.
2. Or approved equal.

C. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.

D. Automatic-Shutoff Quick Couplings: Straight-through brass body with O-ring or gasket seal and stainless-steel or nickel-plated-steel operating parts.

1. Plug End: Straight-through type with barbed outlet for attaching hose.

E. Valveless Quick Couplings: Straight-through brass body with stainless-steel or nickel-plated-steel operating parts.

1. Socket End: With O-ring or gasket seal, without valve, and with barbed inlet for attaching hose.
2. Plug End: With barbed outlet for attaching hose.

2.7 HOSE ASSEMBLIES

A. Description: Compatible hose, clamps, couplings, and splicers suitable for compressed-air service, of nominal diameter indicated, and rated for 300-psig (2070-kPa) minimum working pressure, unless otherwise indicated.

1. Hose: Reinforced double-wire-braid, CR-covered hose for compressed-air service.
2. Hose Clamps: Stainless-steel clamps or bands.
3. Hose Couplings: Two-piece, straight-through, threaded brass or stainless-steel O-ring or gasket-seal swivel coupling with barbed ends for connecting two sections of hose.
4. Hose Splicers: One-piece, straight-through brass or stainless-steel fitting with barbed ends for connecting two sections of hose.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Compressed-Air Piping between Air Compressors and Receivers: Use one of the following piping materials for each size range:

1. NPS 2 (DN 50) and Smaller: Schedule 40, black-steel pipe; wrought-steel fittings; and welded joints.

B. Low-Pressure Compressed-Air Distribution Piping: Use one of the following piping materials for each size range:

1. NPS 2 (DN 50) and Smaller: Schedule 40, black-steel pipe; threaded, malleable-iron fittings; and threaded joints.
2. NPS 2 (DN 50) and Smaller: Type K or L (Type A or B), copper tube; wrought-copper fittings; and brazed or soldered joints.

C. High-Pressure Compressed-Air Distribution Piping: Use one of the following piping materials for each size range:

1. NPS 2 (DN 50) and Smaller: Schedule 40, black-steel pipe; wrought-steel fittings; and welded joints.

3.2 VALVE APPLICATIONS

A. General-Duty Valves: Use metal valves, unless otherwise indicated.

1. Metal General-Duty Valves:

a. Low-Pressure Compressed Air: Valve types specified for low-pressure compressed air.
b. High-Pressure Compressed Air: Valve types specified for medium-pressure compressed air.
c. Equipment Isolation NPS 2 (DN 50) and Smaller: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.
d. Grooved-end valves may be used with grooved-end piping and grooved joints.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping concealed from view and protected from physical contact by building occupants, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.

E. Install piping adjacent to equipment and machines to allow service and maintenance.

F. Install air and drain piping with 1 percent slope downward in direction of flow.

G. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.

H. Equipment and Specialty Flanged Connections:

1. Use steel companion flange with gasket for connection to steel pipe.

2. Use cast-copper-alloy companion flange with gasket and brazed or soldered joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.

I. Install eccentric reducers where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.

J. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.

K. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver.

L. Install piping to permit valve servicing.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Install seismic restraints on piping.

P. Install sleeves for piping penetrations of walls, ceilings, and floors.

Q. Install sleeve seals for piping penetrations of concrete walls and slabs.

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.4 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints for Steel Piping: Join according to AWS D10.12/D10.12M.

E. Brazed Joints for Copper Tubing: Join according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Join according to ASTM B 828 or CDA's "Copper Tube Handbook."

G. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.5 VALVE INSTALLATION

A. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.

B. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.

C. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. NPS 2 (DN 50) and Smaller: Use dielectric unions.

C. NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

3.7 SPECIALTY INSTALLATION

A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.

B. Install air-main pressure regulators in compressed-air piping at or near air compressors.

C. Install air-line pressure regulators in branch piping to equipment and tools.

D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.

E. Install coalescing filters in compressed-air piping at or near air compressors and upstream from mechanical filters. Mount on wall at locations indicated.

F. Install air-line lubricators in branch piping to machine tools. Mount on wall at locations indicated.

G. Install quick couplings at piping terminals for hose connections.

H. Install hose assemblies at hose connections.

3.8 CONNECTIONS

A. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.

B. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment and machine.

3.9 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.

B. Vertical Piping: MSS Type 8 or 42, clamps.

C. Individual, Straight, Horizontal Piping Runs:

1. 100 Feet (30 m) or Less: MSS Type 1, adjustable, steel clevis hangers.
2. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.

D. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

E. Base of Vertical Piping: MSS Type 52, spring hangers.

F. Support horizontal piping within 12 inches (300 mm) of each fitting and coupling.

G. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

H. Install hangers for Schedule 40, steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1/4 to NPS 1/2 (DN 8 to DN 15): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
2. NPS 3/4 to NPS 1-1/4 (DN 20 to DN 32): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
3. NPS 1-1/2 (DN 40): 12 feet (3.7 m) with 3/8-inch (10-mm) rod.
4. NPS 2 (DN 50): 13 feet (4 m) with 3/8-inch (10-mm) rod.
5. NPS 2-1/2 (DN 65): 14 feet (4.3 m) with 1/2-inch (13-mm) rod.

I. Install supports for vertical, Schedule 40, steel piping every 15 feet (4.6 m).

J. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1/4 (DN 8): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3/8 and NPS 1/2 (DN 10 and DN 15): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
3. NPS 3/4 (DN 20): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
4. NPS 1 (DN 25): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
5. NPS 1-1/4 (DN 32): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.
6. NPS 1-1/2 (DN 40): 10 feet (3 m) with 3/8-inch (10-mm) rod.
7. NPS 2 (DN 50): 11 feet (3.4 m) with 3/8-inch (10-mm) rod.
8. NPS 2-1/2 (DN 65): 13 feet (4 m) with 1/2-inch (13-mm) rod.

K. Install supports for vertical copper tubing every 10 feet (3 m).

3.10 LABELING AND IDENTIFICATION

A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."

3.11 FIELD QUALITY CONTROL

A. Perform field tests and inspections.

B. Tests and Inspections:

1. Piping Leak Tests for Metal Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig (345 kPa) above system operating pressure, but not less than 150 psig (1035 kPa). Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
2. Repair leaks and retest until no leaks exist.
3. Inspect filters lubricators and pressure regulators for proper operation.

C. Prepare test reports.

END OF SECTION

GENERAL-SERVICE PACKAGED AIR COMPRESSORS AND RECEIVERS — Section 22 15 19

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. Oilless, reciprocating air compressors.
2. Inlet-air filters.
3. Air-cooled, compressed-air aftercoolers.
4. Water-cooled, compressed-air aftercoolers.
5. Refrigerant compressed-air dryers.

1.3 DEFINITIONS

A. Actual Air: Air delivered from air compressors. Flow rate is delivered compressed air measured in acfm (actual L/s).

B. Standard Air: Free air at 68 deg F (20 deg C) and 1 atmosphere (29.92 in. Hg) before compression or expansion and measured in scfm (standard L/s).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For compressed-air equipment mounting.

1. Detail fabrication and assembly of supports.
2. Include design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For compressed-air equipment, 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.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For compressed-air equipment to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Air-Compressor, Inlet-Air-Filter Elements: Equal to 10 percent of amount installed, but no fewer than 5 units.
2. Belts: One for each belt-driven compressor.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 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. ASME Compliance: Fabricate and label receivers to comply with ASME Boiler and Pressure Vessel Code.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design compressed-air equipment mounting.

B. Seismic Performance: Compressed-air equipment 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 GENERAL REQUIREMENTS FOR PACKAGED AIR COMPRESSORS AND RECEIVERS

A. General Description: Factory-assembled, -wired, -piped, and -tested; electric-motor-driven; air-cooled; continuous-duty air compressors and receivers that deliver air of quality equal to intake air.

B. Control Panels: Automatic control station with load control and protection functions. Comply with NEMA ICS 2 and UL 508.

1. Enclosure: NEMA ICS 6, Type 12 control panel unless otherwise indicated.
2. Motor Controllers: Full-voltage, combination magnetic type with undervoltage release feature and motor-circuit-protector-type disconnecting means and short-circuit protective device.
3. Control Voltage: 120-V ac or less, using integral control power transformer.
4. Motor Overload Protection: Overload relay in each phase.
5. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control.
6. Automatic control switches to alternate lead-lag compressors for duplex air compressors.
7. Instrumentation: Include discharge-air pressure gage, air-filter maintenance indicator, hour meter, compressor discharge-air and coolant temperature gages, and control transformer.
8. Alarm Signal Device: For connection to alarm system to indicate when backup air compressor is operating.

C. Receivers: Steel tank constructed according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

1. Pressure Rating: At least as high as highest discharge pressure of connected compressors, and bearing appropriate code symbols.
2. Interior Finish: Corrosion-resistant coating.
3. Accessories: Include safety valve, pressure gage, drain, and pressure-reducing valve.

D. Mounting Frame: Fabricate mounting and attachment to pressure vessel with reinforcement strong enough to resist packaged equipment movement during a seismic event when base is anchored to building structure.

2.4 OILLESS, RECIPROCATING AIR COMPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:

1. Ingersoll-Rand Company; Compressed Air Solutions.
2. Kaeser Compressors, Inc.
3. Powerex, Inc.
4. Quincy Compressor.

B. Compressor(s): Oilless (nonlubricated), reciprocating-piston type, with sealed oil-free bearings, that deliver air of quality equal to intake air.

1. High discharge-air temperature switch.
2. Belt guard totally enclosing pulleys and belts.

C. Capacities and Characteristics:

1. Air Compressor(s): Two; two stage.

a. Intercooler between stages of two-stage units.

2. Standard-Air Capacity of Each Air Compressor: 13 scfm free air.
3. Actual-Air Capacity of Each Air Compressor: 16.8 acfm delivered.
4. Discharge-Air Pressure: 150 psig.
5. Intake-Air Temperature: 25 deg F above ambient.
6. Discharge-Air Temperature: less than 100 deg F.
7. Mounting: Tank mounted.
8. Motor (Each Air Compressor):

a. Horsepower: 5.
b. Speed: 1040 rpm.

9. Electrical Characteristics:

a. Volts: 230.
b. Phase(s): Three.
c. Full-Load Amperes: 15.2.

10. Receiver: ASME construction steel tank.

a. Arrangement: Vertical.
b. Capacity: 80 gal.
c. Interior Finish: Epoxy or galvanized coating.
d. Pressure Rating: 175 psig minimum.
e. Pressure Regulator Setting: 150 psig.
f. Pressure Relief Valve Setting: 160 psig.
g. Drain: Automatic valve.

2.5 INLET-AIR FILTERS

A. Description: Combination inlet-air filter-silencer, suitable for remote installation, for each air compressor.

1. Construction: Weatherproof housing for replaceable, dry-type filter element, with silencer tubes or other method of sound reduction.
2. Capacity: Match capacity of air compressor, with filter having collection efficiency of 99 percent retention of particles larger than 10 micrometers.

2.6 REFRIGERANT COMPRESSED-AIR DRYERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air/Tak, Inc.
2. Ingersoll-Rand Company; Compressed Air Solutions.
3. Kaeser Compressors, Inc.
4. Zeks Compressed Air Solutions.

B. Description: Noncycling, air-cooled, electric-motor-driven unit with steel enclosure and capability to deliver 35 deg F (2 deg C), 100-psig (690-kPa) air at dew point. Include automatic ejection of condensate from airstream, step-down transformers, disconnect switches, inlet and outlet pressure gages, thermometers, automatic controls, and filters.

C. Capacities and Characteristics:

1. Standard-Air Capacity of Each Compressed-Air Dryer: 15 scfm free air.
2. Pressure: 150 (kPa).
3. Entering-Air Temperature: 115 deg F.
4. Leaving-Air Temperature: 35 deg F.
5. Ambient-Air Temperature: 115 deg F.
6. Maximum Air-Pressure Drop: 5 psig.
7. Motor Horsepower: 0.16 kw.
8. Electrical Characteristics:

a. Volts: 115.
b. Phase(s): Single.
c. Hertz: 60.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Equipment Mounting: Install air compressors and air dryers , on concrete bases using elastomeric pads. Comply with requirements in Section 033000 "Cast-in-Place Concrete."

1. Minimum Deflection: 1/4 inch (6 mm).
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221513 "General-Service Compressed-Air Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to machine, allow space for service and maintenance.

3.3 IDENTIFICATION

A. Identify general-service air compressors and components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check for lubricating oil in lubricated-type equipment.
3. Check belt drives for proper tension.
4. Verify that air-compressor inlet filters and piping are clear.
5. Check for equipment vibration-control supports and flexible pipe connectors, and verify that equipment is properly attached to substrate.
6. Check safety valves for correct settings. Ensure that settings are higher than air-compressor discharge pressure, but not higher than rating of system components.
7. Check for proper seismic restraints.
8. Drain receiver tanks.
9. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
10. Test and adjust controls and safeties.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air compressors and air dryers.

END OF SECTION

FUEL-FIRED, DOMESTIC-WATER HEATERS Section 22 34 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Commercial, gas-fired, 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. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. LEED Submittals:

1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1, Section 7, "Service Water Heating."

C. 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.

D. Source quality-control reports.

E. Field quality-control reports.

F. Warranty: Sample of special warranty.

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. 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. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. 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.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

a. Commercial, Gas-Fired, Domestic-Water Heaters:

1) Heat Exchanger: Three years.
2) Controls and Other Components: Two year(s).
3) Hot-Water Storage Tanks: Three years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS-FIRED, domestic-WATER HEATERS

A. Commercial, Tank-Type, Gas-Fired, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. A.O. Smith Corporation.
b. Lochinvar Corporation.
c. Laars Heating Systems Company; a subsidiary of Bradford White Corporation.
d. Raypak; a Rheem company.

2. Standard: ANSI Z21.10.3/CSA 4.3 for storage type boilers.
3. Description: Vertical storage tank, 95% thermal efficency.
4. Boiler Construction: ASME code with 160-psig (1100-kPa) working-pressure rating for domestic-water heater.

a. Connections: Factory fabricated of materials compatible with boiler. Attach to boiler before testing.

1) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
2) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

5. Boiler Appurtenances:

a. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire boiler except connections and controls.
b. Jacket: Steel with enameled finish.

c. Burner: For use with grid-type, finned-tube, gas-fired, domestic-water heaters and natural-gas fuel.
d. Automatic Ignition: ANSI Z21.20/CSA C22.2 No. 199, intermittent electronic-ignition system.
e. Temperature Control: Adjustable, storage-tank temperature-control fitting and flow switch, interlocked with circulator and burner.
f. Safety Control: Automatic, high-temperature-limit cutoff device or system.

6. Support: Steel base or skids.
7. Draft Hood: Draft diverter, complying with ANSI Z21.12.
8. Automatic Damper: ANSI Z21.66/CSA 6.14-M, Thermally activated, automatic-vent-damper device with size matching draft hood.
9. Hot-Water Storage Tank: 100 gallon.
10. Piping: Copper tubing; copper, solder-joint fittings; and brazed or flanged joints.
11. Mounting: Domestic-water heater, tank, and accessories factory mounted on skids.

B. Capacity and Characteristics: See plans.

2.2 domestic-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL Inc.
b. Flexcon Industries.
c. Taco, Inc.

2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics: 20 gallon acceptance, bladder type.

B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

C. Heat-Trap Fittings: ASHRAE 90.2.

D. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

E. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.

F. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

G. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect assembled domestic-water heaters and storage tanks specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial domestic-water heaters and storage tanks 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. 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.

B. 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.
4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 231123 "Facility Natural-Gas Piping."

C. Install commercial domestic-water heaters with seismic-restraint devices.

D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install 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.

F. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

G. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

H. Fill domestic-water heaters with water.

I. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."

B. Comply with requirements for fuel-oil piping specified in Section 231113 "Facility Fuel-Oil Piping."

C. Comply with requirements for gas piping specified in Section 231123 "Facility Natural-Gas Piping."

D. Drawings indicate g

E. General arrangement of piping, fittings, and specialties.

F. 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. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, domestic-water heaters.

END OF SECTION

RESIDENTIAL PLUMBING FIXTURES Section 22 41 00

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. Faucets.
2. Showers.
3. Sinks.
4. Laundry sinks.
5. Disposers.
6. Supply fittings.
7. Waste fittings.

B. Related Requirements:

1. Section 224213.13 "Commercial Water Closets."
2. Section 224216.13 "Commercial Lavatories."
3. Section 224713 "Drinking Fountains."

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.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

B. Sample Warranty: For special warranty.

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.
3. Flushometer-Tank Repair Kits: Equal to 5 percent of amount of each type installed, but no fewer than two of each type.
4. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 SHOWER FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Shower Faucets: Single handle, thermostatic, mixing valve.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Moen. Model T2444EP

2. Fixture:

a. Standard: ASME A112.18.1/CSA B125.1 and ASSE 1016.
b. General: Include hot- and cold-water indicators; check stops; and fixed shower head, arm, and flange. Coordinate faucet inlets with supplies.
c. Body Material: Solid brass.
d. Finish: Polished chrome plate.
e. Maximum Flow Rate: 1.75 gpm unless otherwise indicated.
f. Mounting: Concealed.
g. Backflow-Prevention Device for Hand-Held Shower: Not required.
h. Operation: Noncompression, manual.
i. Antiscald Device: Integral with mixing valve.
j. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.

3. Supply Connections: NPS 1/2 (DN 15).
4. Shower Head:

a. Type: Ball joint.
b. Shower Head Material: Metallic with chrome-plated finish.
c. Spray Pattern: Fixed.
d. Integral Volume Control: Required.
e. Shower-Arm, Flow-Control Fitting: Not required.

C. Shower Faucets: Single handle, thermostatic, mixing valve, accessible.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Moen Model 8342EP15

2. Fixture:

   a. Standard: ASME A112.18.1/CSA B125.1 and ASSE 1016.
   b. General: Include hot- and cold-water indicators; check stops; and fixed shower head, arm, and flange. Coordinate faucet inlets with supplies.
   c. Body Material: Solid brass.
   d. Finish: Polished chrome plate.
   e. Maximum Flow Rate: 1.5 gpm unless otherwise indicated.
   f. Mounting: Concealed.
   g. Backflow-Prevention Device for Hand-Held Shower: Required.
   h. Operation: Noncompression, manual.
   i. Antiscald Device: Integral with mixing valve.
   j. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.

3. Supply Connections: NPS 1/2 (DN 15).
4. Shower Head:

   a. Type: Ball joint.
   b. Shower Head Material: Metallic with chrome-plated finish.
   c. Spray Pattern: Fixed.
   d. Integral Volume Control: Required.
   e. Shower-Arm, Flow-Control Fitting: Not required.

5. Shower Pan:
   a. Accessibility Professionals model APF6232BFPANC.

2.2 SINKS

A. Sink S-1: Stainless steel, freestanding.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Tabco.
   b. Elkay Manufacturing Co.
   c. Just Manufacturing.

2. Fixture:

   a. Standard: ASME A112.19.3/CSA B45.4.
   b. Type: With backsplash.
   c. Number of Compartments: Two.
   d. Overall Dimensions: 72 inches by 24 inches.
   e. Metal Thickness: 0.050 inch (1.3 mm).

f. Each Compartment:

1) Dimensions: 18 inches by 18 inches.
2) Drains: Grid with NPS 2 (DN 50) tailpiece and twist drain.
3) Drain Location: Centered in compartment.

g. Drainboard(s): Both side(s).

1) Dimensions Each: 18 inches.

3. Supports: Adjustable-length steel legs.
4. Faucet(s): S-1.

a. Number Required: One.
b. Mounting: On backsplash.

5. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Loose key.
2) Risers: NPS 1/2 (DN 15), ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

6. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap(s):

1) Size: 1-1/2 (DN 40).
2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- (0.83-mm-) thick brass tube to wall; and chrome-plated brass or steel wall flange.

c. Continuous Waste:

1) Size: NPS 1-1/2 (DN 40).
2) Material: Chrome-plated, 0.032-inch- (0.83-mm-) thick brass tube.

B. Sinks S-2: Two bowl, counter mounted, stainless steel.

1. Stainless-Steel Kitchen Sinks:

a. Just Manufacturing.
b. Elkay.
c. Or approved equal.

2. Fixture:

   a. Standard: ASME A112.19.3/CSA B45.4 for stainless-steel sinks.
   b. Overall Dimensions: 33 inches by 19 inches.
   c. Metal Thickness: 0.050 inch (1.3 mm).

   d. Left Bowl:

      1) Dimensions: 14 inches by 14 inches.
      2) Drain: 3-1/2-inch (89-mm) grid with offset waste.

         a) Location: Near back of bowl.

   e. Right Bowl:

      1) Dimensions: 14 inches by 14 inches.
      2) Drain: 3-1/2-inch (89-mm) outlet for disposer.

         a) Location: Centered in bowl.

3. Faucet: S-2.
4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
5. Waste Fittings: Comply with requirements in "Waste Fittings" Article, except include continuous waste for multibowl sinks.

   a. Disposer: GD-1.

2.3 LAUNDRY SINK

A. Laundry Sinks: Plastic laundry sink.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Swan Corporation (The). Model MF-1F.
   b. Or approved equal.

2. Fixture:

   a. Standard: IAPMO/ANSI Z124.6.
   b. Style: Flat-rim ledge.
   c. Material: Cast polymer.
   d. Nominal Size: 24 by 23 inches.
   e. Color: White.
   f. Mounting: Freestanding on manufacturer's standard legs or separate, painted-steel stand.

3. Faucet: Swanstone Model CF-1000 Chrome Faucet.
4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
5. Waste Fittings: Comply with requirements in "Waste Fittings" Article.

2.4 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Sink Faucets S-1: Manual type, two-lever-handle mixing valve.

1. Commercial, Solid-Brass Faucets.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Advanced Tabco.
2) Elkay Manufacturing Co.
3) Just Manufacturing.

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: Widespread.
5. Body Material: Commercial, solid brass.
6. Finish: Chrome plated.
7. Maximum Flow Rate: 2.2 gpm (8.3 L/min.).
8. Handle(s): Wrist blade, 4 inches (102 mm).
9. Mounting Type: Back/wall, exposed.
10. Spout Type: Swing, round tubular.
11. Vacuum Breaker: Not required for hose outlet.
12. Spout Outlet: Aerator.
13. Drain: Grid.

C. Sink Faucets S-2: Solid brass.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Just Manufacturing. Model JTR-51-W4.
b. Chicago Faucets.
c. 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 holes; coordinate outlet with spout and fixture receptor.
4. Kitchen Sink Option: Separate hand spray complying with ASSE 1025.
5. Finish: Polished chrome plate.
6. Maximum Flow Rate: 1.5 gpm unless otherwise indicated.
7. Mixing Valve: Two-lever handle.
8. Backflow-Prevention Device for Hand Spray: Not required.
9. Centers: 8 inches (203 mm).
10. Mounting: Deck concealed.
11. Handle(s): Wrist blade, 4 inches (102 mm).
12. Spout Type: Swivel gooseneck.
13. Spout Outlet: 1.5 Aerator.
14. Drain: Grid.

2.5 DISPOSERS

A. Disposers: Continuous-feed household, food waste.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. InSinkErator Evolution Series.

2. Standards: ASSE 1008 and UL 430, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. General: Include reset button; wall switch; corrosion-resistant chamber with jam-resistant, cutlery- or stainless-steel grinder or shredder; NPS 1-1/2 (DN 40) outlet; quick-mounting, stainless-steel sink flange; antisplash guard; and combination cover/stopper.
4. Model: Sound-insulated chamber.
5. Motor: 115-V ac, 1725 rpm, 1/2 hp with overload protection.

2.6 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Kitchen Sink and Laundry Tray Supply Fittings:

1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.

   a. Operation: Loose key.

3. Risers:

   a. Size: NPS 3/8 (DN 10) for lavatories.
   b. Size: NPS 1/2 (DN 15) for bar sinks kitchen sinks and laundry trays.
   c. Material: ASME A112.18.6, braided- or corrugated-stainless-steel flexible hose riser.

2.7 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 (DN 40) offset tailpiece for accessible bar sinks and kitchen sinks.

C. Trap:

1. Size: NPS 1-1/2 (DN 40) for lavatories.
2. Size: NPS 1-1/2 (DN 40) for bar sinks kitchen sinks and laundry trays.

3. Material: Chrome-plated, one-piece, cast-brass trap with swivel 0.029-inch- (73-mm-) thick tubular brass wall bend; and chrome-plated-brass or -steel wall flange.

2.8 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 (34.5-MPa), 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 plumbing-fixture installation.

B. Examine walls, floors, cabinets, and counters for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install plumbing fixtures level and plumb according to roughing-in drawings.

B. Install counter-mounting fixtures in and attached to casework.

C. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture.

D. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

E. Install shower flow-control fittings with specified maximum flow rates in shower arms.

F. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes unless otherwise indicated.

G. Install disposer in outlet of each sink indicated to have a disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

I. 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."

J. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

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."

D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.4 ADJUSTING

A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.

B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed plumbing fixtures and fittings.

D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

COMMERCIAL WATER CLOSETS Section 22 42 13.13

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. Water closets.
2. Flushometer valves.
3. Toilet seats.

B. Related Requirements:

1. Section 224100 "Residential Plumbing Fixtures" for residential water closets.

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 WC-1: Floor mounted, bottom outlet, top spud.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard America.
b. Kohler Co.
c. TOTO USA, INC.

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.
f. Rim Contour: Elongated.
g. Water Consumption: 1.28 gal. (4.8 L) per flush.
h. Spud Size and Location: NPS 1-1/2 (DN 40); top.
i. Color: White.

3. Bowl-to-Drain Connecting Fitting: ASME A112.4.3.
4. Flushometer Valve: WC-1.
5. Toilet Seat: WC-1.

B. Water Closets WC-2: Floor mounted, bottom outlet, top spud, Accessible.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Standard America.
b. Kohler Co.
c. TOTO USA, INC.

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: Handicapped/elderly, complying with ICC/ANSI A117.1.
f. Rim Contour: Elongated.
g. Water Consumption: 1.28 gal. (4.8 L) per flush.
h. Spud Size and Location: NPS 1-1/2 (DN 40); top.
i. Color: White.

3. Bowl-to-Drain Connecting Fitting: ASME A112.4.3.
4. Flushometer Valve: WC-2.

5. Toilet Seat: WC-2.

2.2 FLUSHOMETER VALVES

A. Battery-Powered, Solenoid-Actuator, Piston Flushometer Valves WC-1 and WC-2:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Sloan Valve Company. Model 8111-1.28.
   b. Zurn Industries, LLC; Commercial Brass and Fixtures.
   c. TOTO USA, INC.

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig (860 kPa).
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. Actuator: Solenoid complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
10. Trip Mechanism: Battery-powered electronic sensor complying with UL 1951, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
11. Consumption: 1.28 gal. (4.8 L) per flush.
12. Minimum Inlet: NPS 1 (DN 25).
13. Minimum Outlet: NPS 1-1/4 (DN 32).

2.3 TOILET SEATS

A. Toilet Seats WC-1 and WC-2:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Bemis Manufacturing Company.
   b. Church Seats.
   c. Olsonite Seat Co.

2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Heavy duty).
5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining.
7. Hinge Material: Noncorroding metal.
8. Seat Cover: Not required.
9. Seat Height: Toilet seat height in front to be 1.25 inches.
10. 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.

B. 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 actuators in locations that are easy for people with disabilities to reach.
4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

C. Install toilet seats on water closets.

D. 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."

E. 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 079210 "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 Owner.

END OF SECTION

COMMERCIAL LAVATORIES Section 22 42 16.13

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. 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 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.5 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.

1.6 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. 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 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory L-1: Lavatory integral with counter. See faucet for L-1 below.

B. Lavatory L-2: Ledge back, vitreous china, wall mounted, accessible.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kohler Co model K-2035
b. American Standard America.
c. Or approved equal.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: For wall hanging.
c. Nominal Size: 22 by 18 inches.
d. Faucet-Hole Punching: Three holes, 2-inch (51-mm) centers.
e. Faucet-Hole Location: Top.
f. Color: White.
g. Mounting Material: Chair carrier.

3. Faucet:
4. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier.

2.2 SOLID-BRASS, AUTOMATICALLY OPERATED LAVATORY 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 L-1 and L-2: Automatic-type, battery-powered, electronic-sensor-operated, mixing, solid-brass valve.

1. Sloan EBF-650
2. Or Approved Equal

3. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
4. 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.
5. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.

6. Body Type: Three hole.
7. Body Material: Commercial, solid brass.
8. Finish: Polished chrome plate.
9. Maximum Flow Rate: 0.5 gpm (1.5 L/min.).
10. Mounting Type: Deck, concealed.
11. Spout: Rigid type.
12. Spout Outlet: Aerator.
13. Drain: Grid.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "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 (DN 15).
2. ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.4 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 (DN 32) offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4 (DN 40 by DN 32).
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-(0.83-mm-) 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- (0.30-mm-) 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. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

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 Owner.

END OF SECTION

DRINKING FOUNTAINS Section 22 47 13

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 drinking fountains and related components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of drinking fountain.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include operating characteristics, and furnished specialties and accessories.

B. LEED Submittals:

1. Product Data for Prerequisite WE 1 and Credit WE 3: Documentation indicating flow and water consumption requirements.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For drinking fountains to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 DRINKING FOUNTAINS

A. Drinking Fountains DF-1: Stainless steel, wall mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Haws Corporation. Model 1119.
b. Elkay Manufacturing Co.
c. Halsey Taylor.

2. Standards:

   a. Comply with ASME A112.19.3/CSA B45.4.
   b. Comply with NSF 61.

3. Type Receptor: Slab.
4. Receptor Shape: Rectangular.
5. Back Panel: Stainless-steel wall plate behind drinking fountain.
6. Bubblers: Two, with adjustable stream regulator, located on deck.
7. Control: Push button.
8. Drain: Grid type with NPS 1-1/4 (DN 32) tailpiece.
9. Supply: NPS 3/8 (DN 10) with shutoff valve.
10. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 (DN 32) chrome-plated brass P-trap and waste.
11. Support: ASME A112.6.1M, Type III lavatory carrier.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation.

D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

F. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079210 "Joint Sealants."

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. Install ball, gate, or globe shutoff valve on water supply to each fixture.

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

3.5 CLEANING

A. After installing fixtures, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

* End Division 22 *

Division 23 – HEATING, VENTILATING & AIR CONDITIONING

MECHANICAL GENERAL REQUIREMENTS Section 23 00 10

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The General Conditions and Supplementary Conditions shall apply to and form part of this Division.

1.2 SUMMARY

A. Work includes, but is not limited to, the following:

1. Labor, material, equipment and transportation to complete the Work as shown on the drawings, specified herein and/or implied thereby.
2. A requirement of the plumbing sections shall be to provide make-up water and drain final connections to systems and equipment.
3. It is the intent of the project that the installation be coordinated to provide a complete and usable facility.

B. Work not included in this division:

1. Painting, except as hereinafter specified. See Division 9 for painting.
2. Electrical, except for controls hereinafter specified. See Division 26 for electrical.

C. Related Sections include the following:

1. Division 1 Section 01 91 13 "General Commissioning Requirements."
2. Division 23 Section 23 09 80 "Mechanical Commissioning."
3. Division 23 Section 23 00 50 "Basic Mechanical Materials and Methods."

1.3 DEFINITIONS

A. Unless otherwise specified, "all clarification from," "field direction by," "submittals to," "approved by," "processed by," "permission from," and like mentioned herein shall mean from/by/to Architect.

B. "Provide" means furnish and install referenced item with all appurtenances.

C. "Shall" indicates a mandatory requirement.

D. "Air conditioning" is defined as the treatment and/or handling of any air to any degree by the systems shown on the drawings and herein specified and is not restricted to refrigerated cooling.

1.4 DELIVERY AND STORAGE OF MATERIALS

A. Provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage from any cause whatever, and provide adequate and proper storage facilities during the progress of the work. Replace all damaged and defective work, material or equipment prior to filing application for final acceptance. Properly protect all openings to equipment, piping, ductwork, accessories, etc. from dirt, dust, and debris prior to and during installation of the work. Ductwork stored at the jobsite shall be covered to protect from dirt, dust, debris, fire proofing, etc.

1.5 CODES AND STANDARDS

A. Work and materials shall be in full accordance with the latest rules and regulations of the Local Fire Marshal; the National Electric Code (NEC); the Uniform Plumbing Code; the California Plumbing Code; California Administrative Code, Title 24, (CAL/OSHA); Local Building Codes; the Uniform Mechanical Code; the California Mechanical Code; Vol. II of the Uniform Building Code; Volume I and II of the California Building Code; SMACNA "Guidelines for Seismic Restraints of Mechanical Systems"; and other applicable codes, laws or regulations of bodies lawfully empowered and having jurisdiction over this project. Nothing in the plans or specifications shall be construed to permit work not conforming to these codes. When codes conflict with one another, provide larger, higher or more restrictive standards without additional costs.

1.6 PERMITS

A. Obtain all permits, patent rights, and licenses that are required for the performing of this work by all laws, ordinances, rules and regulations, or orders of any officer and/or body. Provide all notices necessary in connection therewith, and pay all fees relating thereto and all costs and expenses incurred on account thereof. No work shall be covered before inspection by the jurisdictional authorities and observation by the Architect or the owner's designated representatives.

1.7 EXPLANATION AND PRECEDENCE OF DRAWINGS

A. Drawings and specifications are intended to be read together so that any work mentioned in one and not the other shall be executed the same as if mentioned in both.

B. For purposes of clearness and legibility, drawings are essentially diagrammatic. The size and location of equipment is drawn to scale wherever possible. Contractor shall make use of data in the contract documents and shall verify this information at the building site.

C. Where the contract specifications and/or drawings are in conflict, obtain clarification of such during bidding. Where addenda for clarification of such is not timely, base the bid on the higher standards or more restrictive requirements; prior to fabrication, obtain written clarification.

D. The drawings indicate required size and points of termination of pipes, and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. It is not intended that drawings indicate necessary offsets. The Contractor shall make the installation in such a manner as to conform to the structure, avoid obstructions, preserve headroom and keep openings and passageways clear, without further instructions or costs to the Owner.

E. It is intended that apparatus be located symmetrical with architectural elements. Refer to architectural details in completing the correlating work.

F. The Contractor shall study drawings and specifications including, and not limited to, architectural, structural, mechanical, plumbing, fire protection, and electrical to determine conflict with ordinances and statutes. Errors or omissions shall be reported in writing, and changes shall be included in the as-built drawings and the additional work performed at no cost to the Owner.

G. Submittal of bid shall indicate the Contractor has examined the site and drawings and has included required allowances in his bid. No allowance shall be made for any error resulting from Contractor's failure to visit job site and to review drawings and specifications. Bid shall include costs for required drawings and changes as outline above, all at no cost to owner.

1.8 RECORD DRAWINGS

A. In addition for requirements for shop drawings specified elsewhere, provide and maintain on the job one complete set of blue line prints of the record drawings for all the mechanical and plumbing work. Carefully record on this set of prints, work including piping, valves, etc., which is installed differently from that indicated in the specifications and on the drawings; locate dimensionally from fixed points. The depth shall be indicated for all plugged wyes, tees and capped lines.

B. These record drawings shall be continuously kept up-to-date, and shall be available for inspection at all times. Existing lines discovered shall be indicated on these drawings.

C. At completion of work, provide a neat and legible reproducible set of these up-to-date record drawings which shall be individually signed and dated by the Contractor and the job inspector as to their accuracy.

D. Record drawings shall be submitted for acceptance and approval to the Architect and Mechanical Engineer before final certificate of acceptance will be issued.

E. Record drawings shall show the exact location of all control sensor devices.

1.9 CUTTING AND PATCHING

A. Perform all cutting and fitting required for work of this section in rough construction of the building. Obtain permission of the Structural Engineer prior to cutting any structural building elements.

B. All patching of finished construction of building shall be performed under the sections of specifications covering these materials by the trades at no additional cost to the Owner.

C. All cutting of concrete work by Contractor shall be by core drilling or concrete saw. No cutting or coring shall be done without first obtaining the permission of the Architect and Owner.

D. All patching of existing surfaces shall match existing material and finish.

1.10 DAMAGE BY LEAKS

A. Contractor shall be responsible for damage to the grounds, walks, roads, buildings, finishes, surfaces, materials, equipment, piping systems, electrical systems and their equipment and contents, caused by leaks in the piping systems being installed or having been installed herein. He shall repair at his expense all damage so caused. All repair work shall be done as directed by the Architect and Owner.

1.11 EMERGENCY REPAIRS

A. The Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding the Contractor's guarantee bond nor relieving the Contractor of his responsibilities.

1.12 LOCATIONS

A. Coordinate in advance of the work, requirements for openings, equipment maintenance clearances, recesses and chases in the walls, partitions, equipment housekeeping pads, framing or openings. Should furnishing this information be neglected, delayed or incorrect and additional cutting is found to be required, the cost of same shall be borne by the Contractor. Nothing in this paragraph shall be construed to relieve the Contractor of the responsibility for providing and paying for the required core drilling and openings in existing work.

B. Diagrammatic Indications on Drawings are:

1. Approximate only.
2. At various locations shown distorted for clarity.

C. Exact Locations Shall:

1. Be as required for proper installation in available space.
2. Avoid interference with architectural, electrical and structural features.
3. Be coordinated with the work of other trades toward the general purpose of having the work progress rapidly and smoothly with a minimum interference between one trade and another.
4. Preserve headroom and keep openings and passageways clear.
5. Have a neat arrangement symmetrical to the building lines, light and tile pattern.
6. Be reasonably accessible for hung ceiling areas for maintenance from the floor below. Equipment, valves, and other items requiring maintenance, adjustment and/or observation shall be accessible.

1.13 SUPPORTS, EQUIPMENT PADS, STAGING, ETC.

A. Construction supports required for the proper installation of equipment shall be in accordance with the drawings, manufacturer's requirements, seismic requirements, and applicable codes. Check architectural and structural drawings for equipment pads by others. Provide staging, scaffolds, platforms, ladders or similar facilities required to properly install the work.

1.14 INTERRUPTION OF UTILITIES

A. The Contractor shall schedule and coordinate all interruptions of utilities with the Architect and Owner within 30 days after award of contract. The Contractor shall submit to the Owner a schedule of proposed interruptions. At least 72 hours prior to the interruption, the contractor shall submit a request indicating the proposed date and duration of interruption, the work to be accomplished, the areas which will be affected and a proposed contingency plan to be followed in the event that normal service or facilities cannot be restored on schedule. Do not commence work until the time, date, and contingency have been approved in writing by the Architect and Owner.

B. Provide any labor and materials necessary to restore services on a contingency basis should normal service or facilities not be restored on schedule.

C. Preparatory work associated with each interruption shall be performed during normal work hours. The actual interruption required for tie-in shall be performed between 8 P.M. and 5 A.M. Maximum shutdown during this period of any system shall be 4 hours.

1.15 SUBSTITUTIONS

A. If substitutions of controls or equipment requires any changes in the architectural, structural, mechanical, plumbing or electrical work from that shown on the drawings(including all environmental characteristics), the extra cost of the equipment or architectural, structural, mechanical, plumbing or electrical work shall be responsibility of the Contractor requesting the substitution. All substitutions shall be approved by the Architect before purchase by the contractor.

B. If the Contractor proposes substitutions of any equipment specified herein or on the drawings, it shall be the Contractor's responsibility to obtain approval from the Architect for such equipment as well as approval for anchorage of such equipment from the Architect, Structural Engineer, and governing approval agencies. All costs required for such approval shall be the responsibility of the Contractor requesting the substitution.

1.16 PREPARATION OF SUBMITTALS

A. Refer to Division 1. In addition to the requirements of Division 1, provide the requirements specified herein.

B. Prior to commencement of work and in accordance with the General Requirements, submit for review six copies of proposed equipment and material submittals. The Contractor shall verify the delivery dates are compatible with the specified construction schedule; and verify the equipment is sized to accommodate the conditions specified. Submittals shall include manufacturer's names and model numbers and shall comply with specifications and drawings.

The Contractor shall bear the cost of changes necessary to accommodate substitutions if substitution is approved.

C. Provide formal submittal to Architect. Review of the formal submittal is only for general conformance with design concept of project and general compliance with the information given in the contract documents. The Contractor is responsible for confirmation and correlation of the dimensions, quantities and sizes, for information that pertains to fabrication methods or construction techniques, and for coordination of work of all trades. Deviations from Drawings and Specifications shall be clearly and completely indicated (by a separate letter) in the formal submittals. Reviewed Submittals shall not relieve the Contractor of responsibility for errors or deviations.

1. Where specific model numbers and/or manufacturers are specified or shown, it is the intent of the contract documents to procure the specified item(s). Alternate equipment may not be used unless data is submitted for consideration as a substitution in accordance with General Requirements and this section.
2. Model numbers used may not indicate all features or options required for this specific installation. Modify the specified models to comply with the requirements, as specified or shown.
3. Product Data for Proposed Substitutions:

    a. Submit copies of complete data, with drawings and samples as appropriate, including:

        1) Comparison of the qualities of the proposed substitution with that specified.
        2) Changes required in other elements of the work because of the substitution.
        3) Affect on construction schedule.
        4) Cost data comparing the proposed substitution with the product specified.
        5) Availability of maintenance service and source of replacement materials.
        6) Reference to three (3) projects similar to this where such equipment is installed and operating to two (2) or more years.

    b. Acceptance of substitutions is entirely at the discretion of the Architect.

D. Formal submittals shall be complete with catalog data and information properly marked to indicate equality of material (where substitution is allowed and desired), adequacy in capacity and performance to meet minimum capacities or performance as specified or indicated. Arrange the submittals in the same sequence as these Specifications and indicate the Section and Paragraph number (in the upper right-hand side with tabs) for which each submittal is intended. Incomplete submittals shall be rejected.

E. Do not fabricate order or deliver materials or equipment until formal submittals have been approved. Where material or equipment is used without such permission, it is deemed that the material or equipment shall be in complete compliance with drawings and specifications, without additional cost where such compliance is lacking and may be required to be altered in the field.

F. Submittals shall be bound and shall include, at a minimum, the following:

1. Complete bill of materials listing equipment furnished.
2. Catalog cut sheets of every component being provided (highlighted).
3. Provide completed blue-line shop drawings of the packaged equipment detailing all field connection points.
4. Dimensions, clearance requirements, weights, and capacities.

5. Wiring diagrams showing control interface as applicable.
6. Warranty sheets.
7. Pressure drops as applicable.

G. Contractor shall incur all costs for time spent by Engineer for review of more than two submittals on each item. Costs shall be based on Engineer's hourly billing rate schedule at the time of review. Rate schedule available upon request. Engineer shall invoice the contractor upon completion of review and shall be paid by the contractor within 30 days of date of invoice. Failure to remit will withdraw approval (if any) of submittals in question.

1.17 SHOP DRAWINGS:

A. Proceed with preparation of shop drawings immediately upon receiving an authorization to proceed for the project. Shop drawings shall be originally prepared by the contractor. Provide minimum 1/4" scale shop drawings in electronic format. Submit a complete set in one package prior to material fabrication, order and installation.

B. Include:

1. Duct and pipe elevations and sizes.
2. Double line ductwork and piping (4" and larger).
3. Actual size of purchased equipment from certified shop drawings.
4. Access panels including ceiling panels.
5. Access clearances for equipment.
6. Actual locations of ceiling diffusers/ supply registers ad return registers.
7. Actual locations of manual volume dampers.
8. Locations of structural penetrations such as beams.
9. Actual location of control panels and power connections to equipment.
10. Color coded duct and piping based on material used.
11. Label and tag schedule for equipment.
12. Duct transitions to clear beams or tight areas.
13. Room temperature sensor locations.
14. Point of connection to utilities outside the building.
15. Sections or 3-dimensional drawings of congested areas.
16. Gridlines.
17. Duct and piping supports on roof.

C. Coordinate with other trades in preparation of shop drawings.

D. Submit a copy of coordinated shop drawings to General Contractor for distribution to other trades, including electrical and fire sprinkler contractor.

E. Submit to commissioning agent for approval to assure design intent is met.

F. Prior to fabrication and upon receiving approval from commissioning agent, submit a complete set of shop drawings at one time to the mechanical engineer.

1.18 ELECTRICAL REQUIREMENTS

A. Coordinate the following items with Division 26:

1. Power wiring
2. Power Supply Voltage Requirements
3. Safety switches
4. Combination controllers
5. Disconnect switches
6. Motor starters
7. Circuit breakers
8. Motor-control equipment forming part of motor control centers or switchgear assemblies
9. Electrical connections of the mechanical equipment to the electrical power source shall be coordinated with and provided under Division 26.

1.19 MOTORS

A. Before order is placed for electrical devices, the Contractor shall check with the Electrical contractor and verify requirements as to type, mounting and current characteristics as well as to any special delivery instructions. Motors provided under Division 23 shall be minimum of 10% normal rating above brake horsepower (BHP) rating of equipment driven.

1.20 TESTS

A. Contractor shall make tests required by legally constituted authorities and as listed below.

1. Tests shall be made in the presence of the Owner or his representative and a duly authorized inspector. The Owner or his representative shall be notified 5 days before tests are made.
2. Concealed work and insulated work shall remain uncovered until required testing has been performed and approved by the Owner. If work to be tested is covered before the approval of the Owner or his authorized representative has been obtained, it shall be uncovered for testing at the Contractor's expense.
3. Obtain required documents of certification indicating approval, acceptance and compliance with the requirements of all administrative authorities having jurisdiction over the work. No final payment shall be made until all such certificates are delivered to the Owner.
4. Furnish labor, materials, instruments and bear other costs in connection with all tests.
5. Piping systems, except as hereinafter noted, shall be given hydrostatic (with water) test of a least 150% of the maximum operating pressure but no less than 150 psig.
6. Before making test, remove or valve off from the system, gauges, traps, and other apparatus or equipment which may be damaged by test pressure.
7. Install a calibrated test pressure gauge in the system to observe any loss in pressure. Maintain the required test pressure for a sufficient length of time to enable an inspection to be made of all joints and connections. Perform tests after installation and prior to acceptance.
8. Final pressures at the end of the test period shall be no more or less than that caused by expansion or contraction of the test medium due to temperature changes.
9. After tests have been made and leaks repaired, clean and flush systems as hereinafter specified. Water piping shall be left under supply main pressure for the balance of the construction period.

10. Tests for mechanical, plumbing, and fire protection systems are specified within their own section. Equipment and ductwork system tests are specified in the test and balance section.
11. Provide necessary provisions and tests for maintaining the operational condition and cleanliness of existing systems.

1.21 LABOR AND MATERIALS

A. Labor shall be carefully skilled for this kind of work, and under the direction of a competent foreman.

B. Materials shall be new, in perfect condition and of domestic manufacturer. Materials for similar uses to be of same type and manufacturer.

C. Equipment shall bear the manufacturer's label showing performance characteristics. Identifying size number shall be given only when it is not practicable or customary to show performance characteristics.

D. Valves, pipe, fittings, etc., shall bear the manufacturer's name or trademark.

E. Unless otherwise specified herein, equipment and fixtures shall be installed in accordance with the manufacturer's recommendations, including recommended service and removal clearances.

1.22 PROTECTION AND CLEAN-UP

A. Protection: Provide for the safety and good condition of materials and equipment until final acceptance of the Architect. Protect materials and equipment from dirt, dust, debris, and damage from any cause whatever, and provide adequate and proper storage facilities during the progress of the work and replace all damaged and defective material, equipment or work precedent to filing application for final acceptance.

B. Cleaning:

1. Unless a more stringent requirement is specified, thoroughly clean all parts of the piping, ductwork, fixtures, apparatus and equipment. All parts shall be thoroughly cleaned of dirt, dust, debris, cement, plaster and other materials, and all grease and oil spots removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. Clean all systems, including piping and ductwork prior to test.
2. Exposed rough metal work shall be carefully brushed down with steel brushes to remove rust and other spots and left in clean condition to receive painter's finish. Where factory prime coat has been damaged, this Contractor shall be responsible for restoration of same.

1.23 08 31 00 ACCESS DOORS AND PANELS

A. Access Doors and Panels:

1. Wherever volume dampers, fire dampers, smoke fire dampers, controls, valves or other items or parts of the installation which require periodic inspection or adjustments are concealed by permanent non-removable construction, an access door shall be provided.

Rating of access panel shall be determined by rating of wall or ceiling in which panel is installed. Types to be as approved and as appropriate for the surface and construction in which it is installed. Verify all locations with Architect and other trades.

2. Access doors and panels shall be of sufficient size and shall be located properly to assure service to the intended item.

1.24 MAINTENANCE, OPERATION INSTRUCTION

A. General: Thoroughly instruct the Owner's operators in every detail of operation of the system. Provide the Owner with a list of all equipment, giving the manufacturer's name, model number, serial number, parts list and complete internal wiring diagrams. All directions for operation furnished by the manufacturer shall be carefully saved and turned over to the Owner, together with written sequence of operation, operating and maintenance instructions for each system and its equipment. Instruction shall consist of a minimum of four 8-hour periods over consecutive days and shall be 30% classroom and 70% at site location. Coordinate scheduling of instruction times with Owner's operators.

B. Specific Data: Submit four complete sets of the following data to the Owner for approval and commissioning agent for review prior to acceptance of the installation, complete and at one time; (partial or separate data will not be accepted) data shall consist of the following:

1. Valve Directory: Indicating valve number, location, function and normal operating position for each.
2. Color code schedule.
3. Equipment: List of name plates, including name plate data.
4. Manufacturer's Literature: Copies of manufacturer's instructions for operation and maintenance of all mechanical equipment, including replacement parts lists and drawings. Mark or highlight brochure literature indicating the models, sizes, capacities, curve operating points, etc., in a manner to clearly indicate the equipment installed. Remove all pages or sheets from the bulletin and catalogs that do not pertain to equipment installed on the project.
5. Written Instructions: Typewritten instructions for operation and maintenance of the system composed of OPERATING INSTRUCTIONS, MAINTENANCE INSTRUCTIONS and a MAINTENANCE SCHEDULE.

    a. OPERATING INSTRUCTIONS shall contain a brief description of the system. Adjustments requiring the technical knowledge of the service agency personnel shall not be included in the operating instructions. The fact such adjustments are required, however, shall be noted.
    b. MAINTENANCE INSTRUCTIONS shall list each item of equipment requiring inspection, lubrication or service and describe the performance of such maintenance.
    c. MAINTENANCE SCHEDULE shall list each item of equipment requiring maintenance, shall show the exact type of maintenance on every component of each item of equipment, and shall show when each item of equipment should be inspected or services.

6. Instructions: Operating personnel shall be instructed in the operation of the system in accordance with typewritten, approved instructions.

C. Binders: Provide complete sets of the above data in loose-leaf ring-type binders with permanent covers, with identification on front and on spine.

1.25 SPECIAL REQUIREMENTS

A. During the guarantee period and as directed by the Owner, make any additional tests, adjustment, etc., that may be required and correct any defects or deficiencies arising from operation of the systems. Operational tests shall be made during both heating and cooling seasons and on all systems.

B. Completion:

1. The entire mechanical system shall be commissioned in accordance with ASHRAE Guideline 1-1996 and the requirements of this specification. A final commissioning report shall be approved by the Owner, Architect, and Mechanical Engineer prior to final acceptance of the work.
2. When the installation is complete and adjustments specified herein have been made, the system, shall be operated for a period of one week, during which time it shall be demonstrated to the Owner or his representative as being completed and operating in conformance with these specifications. The Contractor shall schedule all work so that this time period, which is to confirm a "bug-free" system, will occur before the total project is accepted for substantial completion by Owner.
3. The work hereunder shall not be reviewed for final acceptance until operating and maintenance data, manufacturer's literature, valve directories, piping identification code directory, and nameplates specified herein have been approved and properly posted in the building.

1.26 WARRANTY/GUARANTEE

A. The contractor shall warranty/guarantee that materials, apparatus, and equipment furnished and installed under the mechanical division of these specifications shall be new and free from all defects. Should any defects develop, within one year (unless a longer period is listed in other sections of the specifications) from the date of final acceptance by the owner or from the date of certificate of substantial completion, whichever is earlier, due to inferior or faulty materials and/or workmanship, the trouble shall be corrected by this Contractor without expense to the Owner. Any defective materials or inferior workmanship noticed at the time of installation or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner.

B. The work shall be installed of such materials and in such a manner that:

1. The operation of all parts of the system shall be noiseless to the extent that no objectionable sound of operation will be heard outside of the rooms enclosing the apparatus or equipment.
2. Apparatus or equipment shall operate in accordance with detailed specifications covering each item.
3. Contractor shall, at his own expense, make any adjustments or changes required to produce a condition of quietness satisfactory to the Engineer or his representative. Such adjustments or changes shall not reduce the performance or quantities called for on the drawings.
4. Contractor shall guarantee that his installation of all materials and equipment will meet the performance requirements of these specifications and that all equipment will deliver the specified or required capacities.

5. The Owner reserves the right to make temporary or emergency repairs as necessary to keep equipment in operating condition without voiding the guarantee contained herein nor relieving the Contractor of his responsibilities during the guarantee period.
6. Contractor shall be responsible for all damage to any part of the premises caused by leaks or break in pipe lines, fixtures or equipment furnished and installed under his contract for a period of one year after date of acceptance of the project by Owner. He shall replace in kind, at his own expense, any and all items so damaged to the complete satisfaction of the Owner.

END OF SECTION

BASIC MECHANICAL MATERIALS AND METHODS — Section 23 00 50

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following basic mechanical materials and methods to complement other Division 23 Sections.

1. Piping materials and installation instructions common to most piping systems.
2. Concrete base construction requirements.
3. Escutcheons.
4. Dielectric fittings.
5. Flexible connectors.
6. Mechanical sleeve seals.
7. Equipment nameplate data requirements.
8. Labeling and identifying mechanical systems and equipment is specified in Division 23 Section "Identification for HVAC Piping and Equipment."
9. Nonshrink grout for equipment installations.
10. Field-fabricated metal and wood equipment supports.
11. Installation requirements common to equipment specification sections.
12. Cutting and patching.
13. Touchup painting and finishing.

B. Pipe and pipe fitting materials are specified in Division 23 piping system Sections.

C. Related Sections include the following:

1. Division 1 Section "LEED Requirements".

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for rubber materials:

1. CR: Chlorosulfonated polyethylene synthetic rubber.
2. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

D. Coordination Drawings: For access panel and door locations.

E. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

1. Planned piping layout, including valve and specialty locations and valve-stem movement.
2. Clearances for installing and maintaining insulation.
3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
4. Equipment and accessory service connections and support details.
5. Exterior wall and foundation penetrations.
6. Fire-rated wall and floor penetrations.
7. Sizes and location of required concrete pads and bases.
8. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
9. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
10. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

F. Samples: Of color, lettering style, and other graphic representation required for each identification material and device.

1.5 QUALITY ASSURANCE

A. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section.

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dielectric Unions:

a. Epco Sales Inc.
b. Watts Industries, Inc.; Water Products Div.
c. Zurn Industries, Inc.; Wilkins Div.

2. Dielectric Flanges:

a. Epco Sales Inc.
b. Watts Industries, Inc.; Water Products Div.

3. Dielectric-Flange Insulating Kits:

a. Calpico, Inc.
b. Central Plastics Co.

4. Dielectric Couplings:

a. Calpico, Inc.
b. Lochinvar Corp.

5. Dielectric Nipples:

a. Grinnell Corp.; Grinnell Supply Sales Co.
b. Victaulic Co. of America.

6. Mechanical Sleeve Seals:

a. Calpico, Inc.
b. Metraflex Co.
c. Thunderline/Link-Seal.

2.2 PIPE AND PIPE FITTINGS

A. Refer to individual Division 23 piping Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.

   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32.

1. Alloy E: Approximately 95 percent tin and 5 percent antimony, lead free.

F. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.
2. BAg1: Silver alloy.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

I. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.
2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.4 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.

G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

H. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.6 PIPING SPECIALTIES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

    a. Underdeck Clamp: Clamping ring with setscrews.

5. PE: Manufactured, reusable, tapered, cup shaped, smooth outer surface, with nailing flange for attaching to wooden forms.

B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.

1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
2. OD: Completely cover opening.
3. Cast Brass: Split casting, with concealed hinge and set screw.

    a. Finish: Rough brass.
    b. Finish: Polished chrome-plate.

4. Stamped Steel: One piece, with spring clips and chrome-plated finish.
5. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
6. Cast-Iron Floor Plate: One-piece casting.

2.7 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psig, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 23 piping Sections specify unique piping installation requirements.

B. General Locations and Arrangements: 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.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's written instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.
2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.

3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

N. Sleeves are not required for core drilled holes.

O. Permanent sleeves are not required for holes formed by PE removable sleeves.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Build sleeves into walls and slabs as work progresses.
3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
    b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
    c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Sections for flashing.

        1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 Sections for materials.
5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 7 Sections for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

V. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
5. 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:

    a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    c. Align threads at point of assembly.
    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    e. 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.

6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

W. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment giving right of way to piping installed at required slope.

F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 PAINTING AND FINISHING

A. Refer to Division 9 Section "Painting" for paint materials, surface preparation, and application of paint.

B. Apply paint to exposed piping according to the following, unless otherwise indicated:

1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

C. Paint visible sheet metal behind ceiling inlets and outlets flat black.

D. Do not paint piping specialties with factory-applied finish.

E. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.7 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.8 GROUTING

A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT — Section 23 05 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes basic requirements for factory-installed motors.

B. Related sections include the following:

1. Division 01 Sustainable Design Requirements – LEED Sections.

1.3 DEFINITIONS

A. Factory-Installed Motor: A motor installed by motorized-equipment manufacturer as a component of equipment.

B. Field-Installed Motor: A motor installed at Project site and not factory installed as an integral component of motorized equipment.

1.4 SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that motors, accessories, and components will withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

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. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer.

C. Qualification Data: For testing agency.

D. Source quality-control test reports.

E. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Source Limitations: Obtain field-installed motors through one source from a single manufacturer.

C. 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.

D. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices and features that comply with the following:

1. Compatible with the following:

a. Magnetic controllers.
b. Multi-speed controllers.
c. Reduced-voltage controllers.

2. Designed and labeled for use with variable frequency controllers, and suitable for use throughout speed range without overheating.
3. Matched to torque and horsepower requirements of the load.
4. Matched to ratings and characteristics of supply circuit and required control sequence.

B. Coordinate motor support with requirements for driven load; access for maintenance and motor replacement; installation of accessories, belts, belt guards; and adjustment of sliding rails for belt tensioning.

C. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 MOTOR REQUIREMENTS

A. Motor requirements apply to factory-and field-installed motors except as follows:

1. Different ratings, performance, or characteristics for motor are specified in another Section.
2. Motorized-equipment manufacturer requires ratings, performance, or characteristics, other than those specified in this Section, to meet performance specified.

2.2 MOTOR CHARACTERISTICS

A. Motors 1/2 HP and Larger: Three phase.

B. Motors Smaller Than 1/2 HP: Single phase.

C. Frequency Rating: 60 Hz.

D. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.

E. Service Factor: 1.15 for open drip-proof motors; 1.0 for totally enclosed motors.

F. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.

G. 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.

H. Enclosure: Open drip-proof or totally enclosed.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium, as defined in NEMA MG 1.

C. Stator: Copper windings, unless otherwise indicated.

1. Multi-speed motors shall have separate winding for each speed.

D. Rotor: Squirrel cage, unless otherwise indicated.

E. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating, unless otherwise indicated.

G. Insulation: Class F, unless otherwise indicated.

H. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

I. Enclosure: Cast iron for motors 7.5 hp and larger; rolled steel for motors smaller than 7.5 hp.

1. Finish: Gray enamel.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Designed with critical vibration frequencies outside operating range of controller output.
2. Temperature Rise: Matched to rating for Class B insulation.
3. Insulation: Class H.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Type: One of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split-phase start, capacitor run.
3. Capacitor start, capacitor run.

B. Shaded-Pole Motors: For motors 1/20 hp and smaller only.

C. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

D. Bearings: Ball type for belt-connected motors and other motors with high radial forces on motor shaft; sealed, prelubricated-sleeve type for other single-phase motors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for conduit systems to verify actual locations of conduit connections before motor installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

END OF SECTION

SLEEVES AND SLEEVE SEALS FOR HVAC PIPING — Section 23 05 17

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

1. Smith, Jay R. Mfg. Co.
2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by the following:

1. Presealed Systems.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 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 (25-mm) 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 (50 mm) 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 (6.4-mm) 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 079210 "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 078400 " Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch (6.4-mm) 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 (50 mm) above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078400 "Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

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 (DN 150) Sleeve-seal fittings.
   b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves, Galvanized-steel wall sleeves or Galvanized-steel-pipe sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system, Galvanized-steel wall sleeves with sleeve-seal system, or Galvanized-steel-pipe sleeves with sleeve-seal system Sleeve-seal fittings.

1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system, Galvanized-steel wall sleeves with sleeve-seal system, or Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system, Galvanized-steel wall sleeves with sleeve-seal system, Galvanized-steel-pipe sleeves with sleeve-seal system, or Sleeve-seal fittings.

1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system, Galvanized-steel wall sleeves with sleeve-seal system, Galvanized-steel-pipe sleeves with sleeve-seal system, or Galvanized-steel-pipe sleeves.

1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6 (DN 150): Stack-sleeve fittings or Sleeve-seal fittings.
b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves Stack-sleeve fittings.

5. Interior Partitions:

a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION

ESCUTCHEONS FOR HVAC PIPING Section 23 05 18

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
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 and rough-brass 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 and rough-brass finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed and exposed-rivet hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

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. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.
j. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.

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 or exposed-rivet 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 Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
g. Bare Piping in Unfinished Service Spaces: Split-casting brass type with polished, chrome-plated finish.

h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
i. Bare Piping in Equipment Rooms: Split-casting brass type with polished, chrome-plated finish.
j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPEMENT — Section 23 05 29

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following hangers and supports for mechanical system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment supports.

B. Related Sections include the following:

1. Division 01 Sustainable Design Requirements – LEED Sections.
2. Division 05 Section 05 50 00 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
3. Division 21 Section 21 13 13 "Wet-Pipe Sprinkler Systems" for pipe hangers for fire-protection piping.
4. Division 23 Section 23 05 48 "Vibration and Seismic Controls for HAVC Piping and Equipment" for vibration isolation devices.
5. Division 23 Section 23 31 13 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.
4. Pipe positioning systems.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

D. 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.

E. Welding Certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel.".

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.
3. Grinnell Corp.
4. National Pipe Hanger Corporation.
5. PHD Manufacturing, Inc.
6. PHS Industries, Inc.
7. Piping Technology and Products, Inc.
8. Tolco, Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Power-Strut Div.; Tyco International, Ltd.
4. Unistrut Corp.; Tyco International, Ltd.
5. Thomas & Betts Corporation
6. Tolco, Inc.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. ERICO/Michigan Hanger Co.
2. Pipe Shields, Inc.
3. Rilco Manufacturing Company, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 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.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated or stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Hilti, Inc.
c. ITW Ramset/Red Head.

2.7 PIPE STAND FABRICATION

A. Pipe Stands, General: 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.

1. Manufacturers:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.

C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.

1. Manufacturers:

a. MIRO Industries.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Manufacturers:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.
c. Portable Pipe Hangers.

2. Base: Plastic.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Manufacturers:

a. Portable Pipe Hangers.

2. Bases: One or more plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.8 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:

1. C & S Mfg. Corp.
2. HOLDRITE Corp.; Hubbard Enterprises.
3. Samco Stamping, Inc.

2.9 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.10 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
9. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. 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-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. 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 above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Sections for roof accessories and curbs.

G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Sections for plumbing fixtures.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. 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.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. 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.

M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

O. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. 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.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 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 smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT — Section 23 05 48

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Restrained elastomeric isolation mounts.
2. Restrained spring isolators.
3. Housed spring mounts.
4. Restrained vibration isolation roof-curb rails.
5. Restraining cables.
6. Steel vibration isolation equipment bases.

B. Related sections include the following:

1. Division 01 Sustainable Design Requirements – LEED Sections.

1.3 DEFINITIONS

A. A: Effective peak velocity related acceleration coefficient.

B. OSHPD: Office of Statewide Health Planning & Development for the State of California. OSHPD assigns a unique anchorage preapproval "R" number to each seismic restraint it tests. The number describes a specific device applied as tested.

1.4 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Speed: 85 MPH.
2. Building Classification Category: II.
3. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

B. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: D.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: II.

    a. Component Importance Factor: 1.0.
    b. Component Response Modification Factor: 2.5.
    c. Component Amplification Factor: 2.5.

3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.374g.
4. Design Spectral Response Acceleration at 1-Second Period: 0.867g.

1.5 SUBMITTALS

A. Product Data: Include load deflection curves for each vibration isolation device.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details 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. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators, seismic 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 Division 23 Sections for equipment mounted outdoors.

2. 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 has been examined for excessive stress and that none will exist.
3. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
4. Seismic Restraint Details:

    a. Design Analysis: To support selection and arrangement of seismic 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 Division 23 Sections for equipment mounted outdoors.
    d. Preapproval and Evaluation Documentation: By an evaluation service member of ICC-ES, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

C. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

D. Shop Drawings: Signed and sealed by a qualified professional engineer. Include the following:

1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
3. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

E. Welding certificates.

F. Manufacturer Seismic Qualification Certification: Submit certification that all specified equipment will withstand seismic forces identified in "Performance Requirements" Article above. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.

   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified. In addition, units field wired to an emergency power source unit will be fully operational after the seismic event.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Seismic-restraint devices shall have horizontal and vertical load testing and analysis performed according to OSHPD and shall bear anchorage preapproval "R" number, from OSHPD or 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 not available, 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. Testing and calculations must include both shear and tensile loads and 1 test or analysis at 45 degrees to the weakest mode.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into base. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

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. Seismic Snubber Units: Furnish replacement neoprene inserts for all snubbers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VIBRATION ISOLATORS

A. Manufacturers:

1. Amber/Booth Company, Inc.
2. Mason Industries, Inc.
3. Vibration Mountings & Controls/Korfund.

B. Restrained Elastomeric Mounts: All-directional elastomeric mountings with seismic restraint.

1. Materials: Cast-ductile-iron housing containing two separate and opposing, molded, bridge-bearing neoprene elements that prevent central threaded sleeve and attachment bolt from contacting the casting during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

C. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.

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 the rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

D. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.

1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel before contacting a resilient collar.

2.3 RESTRAINED VIBRATION ISOLATION ROOF-CURB RAILS

A. Manufacturers:

1. Amber/Booth Company, Inc.
2. Mason Industries, Inc.
3. Vibration Mountings & Controls/Korfund.

B. Description: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail designed to resiliently support equipment and to withstand 125-mph wind impinging laterally against side of equipment.

C. Lower Support Assembly: Sheet-metal "Z" section containing adjustable and removable steel springs that support upper floating frame. Upper frame shall provide continuous support for equipment and shall be captive to resiliently resist wind and seismic forces. Lower support assembly shall have a means for attaching to building structure and a wood nailer for attaching roof materials, and shall be insulated with a minimum of 2 inches of rigid, glass-fiber insulation on inside of assembly.

D. Spring Isolators: Adjustable, restrained spring isolators shall be mounted on 1/4-inch thick, elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.

1. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

    a. Housing: Steel with resilient vertical-limit stops and adjustable equipment mounting and leveling bolt.
    b. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
    c. Minimum Additional Travel: 50 percent of the required deflection at rated load.
    d. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
    e. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2. Elastomeric Isolator Pads: Oil and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirement of supported equipment.

    a. Material: Standard neoprene.
    b. Durometer Rating: 60.
    c. Number of Layers: 2.

E. Snubber Bushings: All-directional, elastomeric snubber bushings at least 1/4 inch thick.

F. Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counterflashed over roof materials.

2.4 SEISMIC-RESTRAINT DEVICES

A. Manufacturers:

1. Amber/Booth Company, Inc.
2. Mason Industries, Inc.
3. Vibration Mountings & Controls/Korfund.

B. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 50, plus or minus 5, with a flat washer face.

C. Restraining Cables: Galvanized steel aircraft cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable engagement.

D. Anchor Bolts: Seismic-rated, drill-in, and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488/E 488M.

2.5 VIBRATION ISOLATION EQUIPMENT BASES

A. Manufacturers:

1. Amber/Booth Company, Inc.
2. Mason Industries, Inc.
3. Vibration Mountings & Controls/Korfund.

B. Steel Base: 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. 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 angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

2.6 FACTORY FINISHES

A. Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be electrogalvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements, installation tolerances, and other conditions affecting performance.

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 INSTALLATION

A. Install equipment supports, and roof penetrations as specified.

B. Install restraining cables at each trapeze and individual pipe hanger. At trapeze anchor locations, shackle piping to trapeze. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.

C. Install steel angles or channel, sized to prevent buckling, clamped with ductile-iron clamps to hanger rods for trapeze and individual pipe hangers. At trapeze anchor locations, shackle piping to trapeze. Requirements apply equally to hanging equipment. Do not weld angles to rods.

D. Install resilient bolt isolation washers on equipment anchor bolts.

3.3 FIELD QUALITY CONTROL

3.4 Testing: Perform the following field quality-control testing:

1. Isolator seismic-restraint clearance.
2. Isolator deflection.

3.5 ADJUSTING

A. Adjust isolators after piping systems have been filled and equipment 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.

C. Adjust active height of spring isolators.

D. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.

E. Torque anchor bolts according to equipment manufacturer's written recommendations to resist seismic forces.

3.6 CLEANING

A. After completing equipment installation, inspect vibration isolation and seismic-control devices. Remove paint splatters and other spots, dirt, and debris.

END OF SECTION

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT — Section 23 05 53

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes mechanical identification materials and devices.

1.3 SUBMITTALS

A. Product Data: For identification materials and devices.

B. Samples: Of color, lettering style, and graphic representation required for each identification material and device.

C. Valve Schedules: For each piping system. Reproduce on standard-size bond paper. Tabulate valve number, piping system, system abbreviation as shown on tag, room or space location of valve, and variations for identification. Mark valves intended for emergency shutoff and similar special uses. Besides mounted copies, furnish copies for maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Comply with ASME A13.1, "Scheme for the Identification of Piping Systems" for lettering size, length of color field, colors, and viewing angles of identification devices.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 IDENTIFYING DEVICES AND LABELS

A. General: Products specified are for applications referenced in other Division 23 Sections. If more than single type is specified for listed applications, selection is Installer's option.

B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
2. Location: Accessible and visible.

C. Stencils: Standard stencils, prepared with letter sizes conforming to recommendations of ASME A13.1. Minimum letter height is 1-1/4 inches for ducts, and 3/4 inch for access door signs and similar operational instructions.

1. Material: Fiberboard.
2. Material: Brass.
3. Stencil Paint: Exterior, oil-based, alkyd gloss black enamel, unless otherwise indicated. Paint may be in pressurized spray-can form.
4. Identification Paint: Exterior, oil-based, alkyd enamel in colors according to ASME A13.1, unless otherwise indicated.

D. Snap-On Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive, vinyl type with permanent adhesive.

F. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

G. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least 3 times letter height and of length required for label.

H. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

1. Arrows: Either integrally with piping system service lettering, to accommodate both directions, or as separate unit, on each pipe marker to indicate direction of flow.

I. Plastic Duct Markers: Manufacturer's standard laminated plastic, in the following color codes:

1. Green: Cold-air supply.
2. Blue: Exhaust, return, and mixed air.
3. Hazardous Material Exhausts: Use colors and designs recommended by ASME A13.1.
4. Terminology: Include direction of airflow; duct service such as supply, return, and exhaust; duct origin, duct destination, and design flow.

J. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive, vinyl tape, at least 3 mils thick.

1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.
2. Color: Comply with ASME A13.1, unless otherwise indicated.

K. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.

1. Material: 0.032-inch- thick, polished brass.
2. Material: 3/32-inch- thick plastic laminate with 2 black surfaces and a white inner layer.
3. Material: Valve manufacturer's standard solid plastic.
4. Size: 1-1/2-inches diameter, unless otherwise indicated.
5. Shape: As indicated for each piping system.

L. Valve Tag Fasteners: Brass, wire-link chain; beaded chain; or S-hooks.

M. Access Panel Markers: 1/16-inch- thick, engraved plastic-laminate markers, with abbreviated terms and numbers corresponding to concealed valve. Provide 1/8-inch center hole for attachment.

N. Valve Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include screws.

1. Frame: Finished hardwood.
2. Frame: Extruded aluminum.
3. Glazing: ASTM C 1036, Type I, Class 1, Glazing quality B, 2.5-mm, single-thickness glass.

O. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
2. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
3. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

P. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Blue: Equipment and components that do not meet criteria above.
4. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
5. Terminology: Match schedules as closely as possible. Include the following:

a. Name and plan number.
b. Equipment service.

c. Design capacity.
d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

6. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

Q. Plasticized Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with mat finish suitable for writing.

1. Size: 3-1/4 by 5-5/8 inches.
2. Fasteners: Brass grommets and wire.
3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.

R. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of mechanical systems and equipment.

1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

PART 3 - EXECUTION

3.1 LABELING AND IDENTIFYING PIPING SYSTEMS

A. Install pipe markers on each system. Include arrows showing normal direction of flow.

B. Marker Type: Stenciled markers complying with ASME A13.1.

C. Marker Type: Plastic markers, with application systems. Install on pipe insulation segment where required for hot, noninsulated pipes.

D. Fasten markers on pipes and insulated pipes smaller than 6 inches OD by one of following methods:

1. Snap-on application of pretensioned, semirigid plastic pipe marker.
2. Adhesive lap joint in pipe marker overlap.
3. Laminated or bonded application of pipe marker to pipe or insulation.
4. Taped to pipe or insulation with color-coded plastic adhesive tape, not less than 3/4 inch wide, lapped a minimum of 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.

E. Fasten markers on pipes and insulated pipes 6 inches in diameter and larger by one of following methods:

1. Laminated or bonded application of pipe marker to pipe or insulation.

2. Taped to pipe or insulation with color-coded plastic adhesive tape, not less than 1-1/2 inches wide, lapped a minimum of 3 inches at both ends of pipe marker, and covering full circumference of pipe.
3. Strapped to pipe or insulation with manufacturer's standard stainless-steel bands.

F. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations according to the following:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
3. Near penetrations through walls, floors, ceilings, or nonaccessible 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 a maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.2 VALVE TAGS

A. Install on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, plumbing fixture supply stops, 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 valve schedule.

B. Tag Material: Brass.

C. Tag Material: Plastic.

D. Tag Size and Shape: According to the following:

1. Cold Water: 2 inches, round.
2. Cold Water: 1-1/2 inches, square.
3. Hot Water: 2 inches, round.
4. Hot Water: 1-1/2 inches, square.
5. Gas: 2 inches, round.
6. Gas: 1-1/2 inches, square.
7. Refrigerant: 1-1/2 inches, square.

E. Tag Color: According to the following:

1. Cold Water: Blue.
2. Hot Water: Green.
3. Gas: Yellow.
4. Refrigerant: Green.

F. Letter Color: According to the following:

1. Cold Water: Black.
2. Hot Water: Black.
3. Gas: Black.
4. Refrigerant: Black.

G. Install mounted valve schedule in each major equipment room.

3.3 EQUIPMENT SIGNS AND MARKERS

A. Install engraved plastic-laminate signs or equipment markers on or near each major item of mechanical equipment. Include signs for the following general categories of equipment:

1. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
2. Fire department hose valves and hose stations.
3. Meters, gages, thermometers, and similar units.
4. Fuel-burning units, including boilers, and heaters.
5. Pumps and similar motor-driven units.
6. Coils, evaporators, and similar equipment.
7. Fans, blowers, primary balancing dampers, and mixing boxes.
8. Packaged central-station air handling units and zone-type units.
9. Tanks and pressure vessels.
10. Strainers, filters, water-treatment systems, and similar equipment.
11. Thermostats, CO sensors and CO2 sensors.

B. Optional Sign Types: Stenciled signs may be provided instead of engraved plastic, at Installer's option, where lettering larger than 1-inch high is needed for proper identification because of distance from normal location of required identification.

1. Lettering Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
2. Terms on Signs: Distinguish between multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.

C. Plasticized Tags: Install within concealed space, to reduce amount of text in exposed sign outside concealment, if equipment to be identified is concealed above acoustical ceiling or similar concealment.

1. Identify operational valves and similar minor equipment items located in unoccupied spaces, including machine rooms, by installing plasticized tags.

D. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows showing service and direction of flow.

1. Location: Locate signs near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.4 ADJUSTING AND CLEANING

A. Relocate mechanical identification materials and devices that have become visually blocked by work of this or other Divisions.

B. Clean faces of identification devices and glass frames of valve charts.

END OF SECTION

TESTING, ADJUSTING, AND BALANCING FOR HVAC — Section 23 05 93

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:

1. Balancing airflow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
2. Adjusting total HVAC systems to provide indicated quantities.
3. Measuring electrical performance of HVAC equipment.
4. Setting quantitative performance of HVAC equipment.
5. Verifying that automatic control devices are functioning properly.
6. Measuring sound and vibration.
7. Reporting results of the activities and procedures specified in this Section.

B. Related Sections include the following:

1. Division 01 Sustainable Design Requirements – LEED Sections.
2. Division 01 Section 01 91 00 "General Commissioning Requirements."
3. Division 23 Section 23 09 80 "Mechanical Commissioning."
4. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
5. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

M. AABC: Associated Air Balance Council.

N. AMCA: Air Movement and Control Association.

O. CTI: Cooling Tower Institute.

P. NEBB: National Environmental Balancing Bureau.

Q. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.

D. Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures

as specified in Part 3 "Preparation" Article below. Include a complete set of report forms intended for use on this Project.

E. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

F. Sample Report Forms: Submit 2 sets of sample testing, adjusting, and balancing report forms.

G. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.5 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.

B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Architect's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.
b. Contract Documents examination report.
c. Testing, adjusting, and balancing plan.
d. Work schedule and Project site access requirements.
e. Coordination and cooperation of trades and subcontractors.
f. Coordination of documentation and communication flow.

C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

D. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing."

E. Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

F. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.

G. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

H. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. National Project Performance (or special) Guarantee: Provide a guarantee on AABC'S "National Standards" (or NEBB) forms stating that AABC (or NEBB) will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified Agent has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine project record documents described in Division 01 Section for Project Record Documents.

D. Examine Architect's and Engineer's 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 equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine fan coil units to verify that they are accessible and their controls are connected and functioning.

L. Examine plenums, utilized for outside air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine equipment for installation and for properly operating safety interlocks and controls.

O. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices operate by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions.
4. Automatic modulating and shutoff valves are properly connected.
5. Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to design values.

P. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Isolating and balancing valves are open and control valves are operational.
6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
7. Windows and doors can be closed so design conditions for system operations can be met.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards (or NEBB's Procedural Standards for Testing Adjusting, and Balancing of Environmental Systems") and this Section.

B. 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 this Section.

C. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those

removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

D. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check the airflow patterns from the outside-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.

3.5 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems. Additional procedures are required for variable-air-volume, and process exhaust-air systems. These additional procedures are specified in other articles in this Section.

B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

    a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.

d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each air-handling unit component.

a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Adjust fan speed higher or lower than design with the approval of the Architect. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. 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 no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.

C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.

D. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or the outlet manufacturer's written instructions and calculating factors.

E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.

1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating if high-efficiency motor.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.7 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of 2 successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.8 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow measurements. Note the speed of response to input changes.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Verify main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.9 TOLERANCES

A. Set HVAC system airflow rates within the following tolerances:

1. Supply, Return and Exhaust Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.

3.10 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of testing, adjusting, and balancing Agent.

3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of testing, adjusting, and balancing Agent who certifies the report.
10. Summary of contents, including the following:

    a. Design versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer, type size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from design values.
14. Test conditions for fans and pump performance forms, including the following:

    a. Settings for outside-, 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. Variable speed drive settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air distribution systems. Present with single-line diagrams and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Pipe and valve sizes and locations.
4. Balancing stations.

F. Air-Handling Unit Test Reports: For air-handling and fan coil units with coils, include the following:

1. Unit Data: Include the following:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.

i. Sheave dimensions, center-to-center and amount of adjustments in inches.
j. Number of belts, make, and size.
k. Number of filters, type, and size.

2. Motor Data: Include the following:

a. 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. Sheave dimensions, center-to-center and amount of adjustments in inches.

3. Test Data: Include design and actual values for the following:

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. Filter static-pressure differential in inches wg.
f. Cooling coil static-pressure differential in inches wg.
g. Heating coil static-pressure differential in inches wg.
h. Outside airflow in cfm.
i. Return airflow in cfm.
j. Outside-air damper position.
k. Return-air damper position.

G. Fan Test Reports: For supply and exhaust fans, include the following:

1. Fan Data: Include the following:

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. Sheave dimensions, center-to-center and amount of adjustments in inches.

2. Motor Data: Include the following:

a. 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. Sheave dimensions, center-to-center and amount of adjustments in inches.
g. Number of belts, make, and size.

3. Test Data: Include design and actual values for the following:

   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.

H. 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: Include the following:

   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. Design airflow rate in cfm.
   h. Design velocity in fpm.
   i. Actual airflow rate in cfm.
   j. Actual average velocity in fpm.
   k. Barometric pressure in psig.

I. Compressor and Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, include the following:

1. Unit Data: Include the following:

   a. Unit identification.
   b. Location.
   c. Unit make and model number.
   d. Manufacturer's compressor serial numbers.
   e. Compressor make.
   f. Compressor model and serial numbers.
   g. Refrigerant weight in lb.
   h. Low ambient temperature cutoff in deg F.

2. Test Data: Include design and actual values for the following:

   a. Entering-air, dry-bulb temperature in deg F.
   b. Leaving-air, dry-bulb temperature in deg F.
   c. Control settings.
   d. Unloader set points.
   e. Low-pressure-cutout set point in psig.
   f. High-pressure-cutout set point in psig.
   g. Suction pressure in psig.
   h. Suction temperature in deg F.
   i. Condenser refrigerant pressure in psig.

j. Condenser refrigerant temperature in deg F.
k. Oil pressure in psig.
l. Oil temperature in deg F.
m. Voltage at each connection.
n. Amperage for each phase.
o. The kW input.
p. Crankcase heater kW.
q. Number of fans.
r. Condenser fan rpm.
s. Condenser fan airflow rate in cfm.
t. Condenser fan motor make, frame size, rpm, and horsepower.
u. Condenser fan motor voltage at each connection.
v. Condenser fan motor amperage for each phase.

J. Instrument Calibration Reports: For instrument calibration, include the following:

1. Report Data: Include the following:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.12 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION

DUCT INSULATION Section 23 07 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes semirigid and flexible duct, and plenum, insulation; insulating cements; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Division 01 Sustainable Design Requirements – LEED Sections.
2. Division 07 Section 07 84 00 Firestopping, for materials and requirements for penetrations through fire and smoke barriers.
3. Division 23 Insulation Sections 23 07 13 Duct Insulation and 23 07 19 HVAC Piping Insulation for insulation for piping systems.
4. Division 23 Section 23 31 13 "Metal Ducts" for duct liner.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings: Show fabrication and installation details for the following:

1. Removable insulation sections at access panels.
2. Application of field-applied jackets.
3. Applications at linkages for control devices.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

E. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate clearance requirements with duct Installer for insulation application.

1.7 SCHEDULING

A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

1.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mineral-Fiber Insulation:

a. CertainTeed Manson.
b. Knauf FiberGlass GmbH.
c. Owens-Corning Fiberglas Corp.
d. Schuller International, Inc.

1.2 INSULATION MATERIALS

A. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

1.3 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8-oz./sq. yd.

1. Tape Width: 4 inches.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
2. Galvanized Steel: 0.005 inch thick.
3. Nickel-Copper Alloy: 0.005 inch thick.

C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

D. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts and plenums; and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface.

1.4 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

1.5 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1.6 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

1.7 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.

1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.
2. Apply insulation for exterior applications tightly joined to interior insulation ends.
3. Seal insulation to roof flashing with vapor-retarder mastic.

P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

Q. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

1.8 MINERAL-FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.

4. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
5. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
6. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
b. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.

7. Impale insulation over anchors and attach speed washers.
8. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
9. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1 inch o.c., and cover with pressure-sensitive tape having same facing as insulation.

10. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches o.c.
11. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
12. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.
13. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

1.9 FINISHES

A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 09 Painting Sections.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

1.10 DUCT SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

C. Insulate the following plenums and duct systems:

14. Indoor concealed supply-, return-, and outside-air ductwork.
15. Indoor exposed supply-, return-, and outside-air ductwork.

D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
5. Flexible connectors.
6. Vibration-control devices.
7. Testing agency labels and stamps.
8. Nameplates and data plates.
9. Access panels and doors in air-distribution systems.

1.11 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

A. Service: Round, supply-air ducts, concealed.

10. Material: Mineral-fiber blanket.

11. Thickness: 2 inches.
12. Number of Layers: One.
13. Vapor Retarder Required: Yes.

B. Service: Round, return-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 1 inch.
3. Number of Layers: One.
4. Vapor Retarder Required: Yes.

C. Service: Rectangular, supply-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches.
3. Number of Layers: One.
4. Vapor Retarder Required: Yes.

D. Service: Rectangular, return-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 1 inch.
3. Number of Layers: One.
4. Vapor Retarder Required: Yes.

E. Service: Round, supply-air ducts, exposed, in non-conditioned room.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches.
3. Number of Layers: One.
4. Vapor Retarder Required: Yes.

F. Service: Round, return-air ducts, exposed, in non-conditioned room.

1. Material: Mineral-fiber blanket.
2. Thickness: 1 inch.
3. Number of Layers: One.
4. Vapor Retarder Required: Yes.

G. Service: Rectangular, supply-air ducts, exposed, in non-conditioned room.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches.
3. Number of Layers: One.
4. Vapor Retarder Required: Yes.

H. Service: Rectangular, return-air ducts, exposed, in non-conditioned room.

1. Material: Mineral-fiber blanket.
2. Thickness: 1 inch.

3. Number of Layers: One.
4. Vapor Retarder Required: No.

END OF SECTION

HVAC PIPING INSULATION Section 23 07 19

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Condensate drain piping, indoors.
2. Refrigerant suction and hot-gas piping, indoors and outdoors.

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. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: 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.

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 and inspecting 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.

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 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.

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 "Piping Insulation Schedule, General," "Indoor Piping 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. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

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. Aeroflex USA, Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Johns Manville; Micro-Lok.
   b. Knauf Insulation; 1000-Degree Pipe Insulation.
   c. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Childers 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; 85-60/85-70.
   d. Mon-Eco Industries, Inc.; 22-25.

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."

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 (0.127 mm) thick and an epoxy finish 5 mils (0.127 mm) thick if operating in a temperature range between 140 and 300 deg F (60 and 149 deg C). 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 (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

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. 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 (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. 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 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078400 "Firestopping" for firestopping and fire-resistive joint sealers.

D. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078400 "Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

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. 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.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 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.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F (16 Deg C):

1. All Pipe Sizes: Insulation shall be the following: Retain one or more of six subparagraphs below.

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch (13 mm) thick.

B. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

b. Flexible Elastomeric: 1 inch thick.

C. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
b. Flexible Elastomeric: 1 inch thick

3.11 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
b. Flexible Elastomeric: 1-1/2 inch thick.

B. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
b. Flexible Elastomeric: 1-1/2 inch thick.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. None.

3.13 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. PVC: 30 mils thick.

END OF SECTION

HVAC INSTRUMENTATION AND CONTROLS Section 23 09 00

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Scope of Work Covered by this Section:

1. Furnish a totally native BACnet-based system to integrate propriatery Daikin VRV units via manufacturer provided BACnet protocol converter, exhaust fans, global controller including a Webserver for graphical user interface via world wide web. The global controller, exhaust fan controllers and all input/output devices shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135, BACnet.
2. Provide all necessary BACnet-compliant hardware and software to meet the system's functional specifications.
3. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.
4. Implement the detailed design for all analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.
5. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.
6. Provide and install all interconnecting cables between supplied cabinets, application controllers, and input/output devices.
7. Provide and install all interconnecting cables between all operator's terminals and peripheral devices supplied under this section.
8. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.
9. Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, startup, and commissioning.
10. Provide a comprehensive operator and technician training program as described herein.
11. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.
12. Provide new sensors, dampers, valves, and install only new electronic actuators. No used components shall be used as any part or piece of installed system.
13. Provide commissioning related requirements per commissioning spec section 230800.

1.2 RELATED SECTIONS

A. Section 230050 - Basic Mechanical Materials and Methods: Piping and terminal units requirements.

B. Section 260050 - Basic Electrical Materials and Methods: Terminal unit rough-in requirements.

C. Section 230980 – Mechanical Commissioning

D. Section 230993 – Sequence of Operations for HVAC Controls

1.3 REFERENCE STANDARDS

A. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):

B. ANSI/ASHRAE Standard 135, BACnet.

C. Uniform Building Code (UBC), including local amendments.

D. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.

E. National Electrical Code (NEC).

F. FCC Part 15, Subpart J, Class A.

G. EMC Directive 89/336/EEC (European CE Mark).

H. UL-864 UUKL listing for Smoke Controls for any equipment used in smoke control sequences.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 10 Submittals.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Drawings:

1. Drawings need to comply with electronic submittal requirements specified in Division 1.
2. The system supplier shall submit engineered drawings, control sequence, and bill of materials for approval.
3. Drawings shall be submitted in the following standard sizes: 11 x 17 inch (ANSI B).
4. Eight complete sets (copies) of submittal drawings shall be provided.
5. Drawings shall be available on CD-ROM.

D. System Documentation: Include the following in submittal package:

1. System configuration diagrams in simplified block format.
2. All input/output object listings and an alarm point summary listing.
3. Electrical drawings that show all system internal and external connection points, terminal block layouts, and terminal identification.
4. Complete bill of materials, valve schedule and damper schedule.
5. Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.
6. Overall system operation and maintenance instructions-including preventive maintenance and troubleshooting instructions.
7. For all system elements-operator's workstations, building controllers, application controllers, routers, and repeaters-provide BACnet Protocol Implementation Conformance Statements (PICS) as per ANSI/ASHRAE Standard 135.
8. Provide complete description and documentation of any proprietary (non-BACnet) services and/or objects used in the system.
9. A list of all functions available and a sample of function block programming that shall be part of delivered system.

E. Project Management: The vendor shall provide a detailed project design and installation schedule with time markings and details for hardware items and software development phases.

1.5 QUALITY ASSURANCE

A. The Building Automation System (BAS) system shall be designed, installed, commissioned, and serviced by manufacturer authorized and trained personnel. System provider shall have an in-place support facility within 2 hours response time of the site with technical staff, spare parts inventory, and necessary test and diagnostic equipment.

B. The contractor shall provide full-time, on-site, experienced project manager for this work, responsible for direct supervision of the design, installation, start-up and commissioning of the BAS system. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

C. The Bidder shall be regularly engaged in the design, installation and maintenance of BAS systems and shall have demonstrated technical expertise and experience in the design, installation and maintenance of BAS systems similar in size and complexity to this project.

D. Materials and equipment shall be manufacturer's latest standard design that complies with the specification requirements.

E. All BAS peer-to-peer network controllers, central system controllers and local user displays shall be UL Listed under Standard UL 916, category PAZX.

F. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

G. Control system shall be engineered, programmed and supported completely by representative's local office that must be within 100 miles (161 km) of project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened, labeled packaging until ready for installation. Store products within the range of manufacturer's absolute limits for environmental conditions including but not limited to temperature and humidity.

1.7 WARRANTY

A. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one year from completion of system acceptance. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours, Monday through Friday and 48 hours on Saturday and Sunday. Warranty shall apply equally to both hardware and software.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Alerton Inc, Siemens, Automated Logic.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 SYSTEM DESCRIPTION

A. A distributed logic control system complete with all software and hardware functions shall be provided and installed. System shall be completely based on ANSI/ASHRAE Standard 135-2008, BACnet and achieved listing under the BACnet Testing Laboratories BACnet. Global controller shall integrate Daikin VRV System, exhaust fan controllers and other HVAC system controls to single global controller and web server.

2.3 DDC EQUIPMENT AND SOFTWARE

A. Workstation: IBM-compatible microcomputer with minimum configuration as follows:

1. Processor: Intel Pentium, 3.2 GHC.
2. Random-Access Memory: 1.0 GB RAM.
3. Hard-Disk Drive: 120 GB.
4. Tape Backup System (120 GB compressed.)
5. CD Rom & CD Burner.

2.4 ELECTRIC THERMOSTATS

A. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, integral manual on-off-auto selector switch.

1. Equip thermostats, which control electric coiling fans directly, with off position on dial wired to break ungrounded conductors.

2.5 CO SYSTEM SPECIFICATION

A. The Carbon Monoxide Detecting and Ventilation Fan Control System (CO System) including, wiring and conduit, shall be furnished and installed by AC Energy Systems, Inc., or approved equal, to provide a complete operational system. All conduit, wiring and terminations shall be in accordance with the manufacturer's printed instructions. All wiring to be in conduit. No exposed wiring is allowed. Starters shall be furnished and installed by others.

B. CO System shall be microprocessor based utilizing MOS (metal oxide semiconductor) solid state remote sensors as manufactured by Quantum Group, Inc.

C. All periodic calibration and maintenance labor and materials shall be included to cover a period of 12 months from owner's acceptance of the CO System. Quantum CO Control board shall have a 5-year factory equipment warranty. The plug-in CO module shall have a 2.5-year warranty.

D. Each CO sensor shall be housed in a lockable, painted, 16 gauge steel enclosure. Enclosure shall have colored panel lights that are labeled: "POWER", "FAN", and "ALARM". An 85-dB audible alarm shall be mounted at each sensor location to alarm if alarm limits are exceeded for 15 minutes of if sensor is in fault.

E. Each CO sensor shall automatically compensate for temperature and humidity over the range of -10 to 125 F and 10-90% relative humidity to stabilize the setpoint and prevent false alarms.

F. CO System shall turn fan(s) on when CO level exceeds 25 ppm for more than 3 minutes. Fans shall automatically turn off when CO levels drop below 25 ppm. System shall have a "minimum fan run-time" to allow fan motors to cool off.

G. Unit shall go into high CO alarm if the CO level exceeds 100 ppm for 15 minutes of the concentration over the previous 8 hours exceeds and average of 25 ppm. Alarms at each

sensing unit shall automatically reset when CO concentration levels fall below the alarm level.

H. Sensors shall be factory pre-calibrated and shall be a plug-in module not requiring any soldering, mechanical fastening or wiring. Unit shall provide an audible signal 60 days prior to expiration of sensor module. If the sensor module is not replaced within 60 days, then the unit shall turn fans on and signal a fault condition.

I. CO System to provide fail-safe (fans running) operation if control wires are broken, sensor fails, or power is lost to the sensing unit

2.6 WEB INTERFACE

A. General:

1. BAS supplier shall provide Web-based access to the system as part of standard installation. User must be able to access all displays of real-time data that are part of the BAS using a standard Web browser. Web browser shall tie into the network through owner-supplied Ethernet network connection. Web page host shall be a separate device that resides on the BAS BACnet network, but is not the BAS server for the control system. BAS server must be a separate computer from the Web page host device to ensure data and system integrity. The Web page software shall not require a per-user licensing fee or annual fees. The Web page host must be able to support on average 50 simultaneous users with the ability to expand the system to accommodate an unlimited number of users. Provide Iport or BCM WEB as applicable to project size.

B. Browser Technology:

1. Browser shall be standard version of Microsoft Internet Explorer v6.0 or later, Firefox v2.0 or later and Safari v2.0 or later (on Mac OS X). PDA browser connection shall be Pocket PC 2003, Windows Mobile 5.0, or Blackberry. No special vendor-supplied software shall be needed on computers running browser. All displays shall be viewable and the Web page host shall directly access real-time data from the BAS BACnet network. Data shall be displayed in real-time and update automatically without user interaction. User shall be able to change data on displays if logged in with the appropriate user name and password.

C. Communications:

1. Web page host shall include two Ethernet network connections. One network connection shall be dedicated to BAS BACnet network and shall be used to gather real-time data from all the BACnet devices that form the BAS. This network shall communicate using BACnet, allowing the Web page host to gather data directly from units on the local LAN or from other projects connected over a WAN. This network shall also provide the connection to the BAS server for Web page generation.
2. The second Ethernet connection shall provide the physical connection to the Internet or an IP-based WAN. It shall be the port that is used for the browser to receive Web pages and data from the Web page host. The Web page host shall act as a physical barrier between the BAS network and the WAN or Internet connection that allows the browser to receive Web pages and data. The two separate network connections provide for a physical barrier to prevent raw BACnet traffic being exposed on the IP network.
3. The Web page host shall provide for complete isolation of the IP and BACnet networks by not routing networking packets between the two networks.
4. BAS BACnet Ethernet network shall be provided and installed by the BAS supplier. Owner shall provide and incur any monthly charges of WAN/Internet connection.

D. Display of Data:

1. Web page graphics shown on browser shall be replicas of the BAS displays. User shall need no additional training to understand information presented on Web pages when compared to what is shown on BAS displays. Web page displays shall include animation just as BAS displays. Fans shall turn, pilot lights shall blink, coils shall change colors, and so on.
2. Real-time data shall be shown on all browser Web pages. This data must be directly gathered using the BACnet network and automatically updated on browser Web page displays without any user action. Data on the browser shall automatically refresh as changes are detected without re-drawing the complete display.
3. It shall be possible for user from browser Web page to change data if the user is logged on with the appropriate password. Clicking on a button or typing in a new value shall change digital data. Using pull-down menus or typing in a new value shall change analog data.
4. Data displays shall be navigated using pushbuttons on the displays that are simply clicked on with the mouse to select a new display. Alternatively, the standard back and forward buttons of the browser can be used for display navigation.

E. Time Schedule Adjustment:

1. Web access shall allow user to view and edit all schedules in the system. This includes standard, holiday and event schedules as described in BAS specification. Display of schedules shall show interaction of all schedules on a single display so user sees an overview of how all work together. User shall be able to edit schedules from this display.
2. Display of all three schedules must show all ON times for standard, holiday and event schedules in different colors on a given day. In addition, OFF times for each must also be shown in additional colors. User shall be able to select from standard calendar what days are to be scheduled and same display shall show all points and zones affected. User shall be able to set time for one day and select all days of the week that shall be affected as a recurrence of that same schedule for that given day.
3. Schedule list shall show all schedules currently defined. This list shall include all standard, holiday and event schedules. In addition, user shall be able to select a list that shows all scheduled points and zones.

F. Logging of Information:

1. User shall use standard browser technology to view all trendlogs in system. User shall be able to view logged data in tabular form or graphical format. User shall be able to adjust time interval of logged data viewed and shall be able to adjust Y axis of data viewed in graphical format. User shall also be able to download data through the Web interface to local computer. Data shall be in CSV format.

G. Alarm Handling:

1. Web interface shall display alarms as they occur. User shall be able to acknowledge alarms using browser technology. In addition, user shall be able to view history of alarm occurrence over a user-selected time frame. In addition, those alarms may be filtered for viewing per user-selected options. A single selection shall display all alarms that have not been acknowledged.

H. Web Page Generation:

1. Web pages shall be automatically generated from the BAS displays that reside on the BAS server. User shall access Web page host through the network and shall initiate a

Web page generation utility that automatically takes the BAS displays and turns them into Web pages. The Web pages generated are automatically installed on the Web page host for access using any computer's standard browser. Any system that requires use of an HTML editor for generation of Web pages shall not be considered.

I. Password Security and Activity Log:

1. Access through Web browser shall utilize the same hierarchical security scheme as BAS system. User shall be asked to log on once the browser makes connection to Web page host. Once the user logs in, any and all changes that are made shall be tracked by the BAS system. The user shall be able to change only those items he or she has authority to change. A user activity report shall show any and all activity of the users who have logged in to the system, regardless of whether those changes were made using a browser or through the BAS workstation.

J. BACnet Communication:

1. Web server shall directly communicate to all devices on the BAS network using BACnet protocol. No intermediate devices shall be necessary for BACnet communication.

2.7 BUILDING GLOBAL CONTROLLER

A. General Requirements:

1. BACnet Conformance:

a. Building Controller shall be approved by the BTL as meeting the BACnet Building Controller requirements.
b. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

2. Building controller shall be of modular construction such that various modules may be selected to fit the specific requirements of a given project. At a minimum, modules shall consist of a power supply module, a BACnet Ethernet-MS/TP (master slave token passing) module, a BACnet MS/TP-only module, and a modem module for telephone communication. Those projects that require special interfaces may use Modbus modules as needed. However, all Ethernet communications and all controllers-including central plant controllers, advanced application controllers and unitary controllers-supplied by BAS manufacturer shall utilize the BACnet protocol standard.
3. Modules shall be selected to fit the particular project application. Up to seven modules shall be powered by a single power supply module. All modules shall be panel-mounted on DIN rail for ease of addition and shall be interconnected using a simple plug-in cable. A module in the middle shall be replaceable without removing any other modules.
4. All modules shall be capable of providing global control strategies for the system based on information from any objects in the system, regardless if the object is directly monitored by the building controller module or by another controller. The software program implementing these strategies shall be completely flexible and user-definable. All software tools necessary for programming shall be provided as part of project software. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site, using a WAN or downloaded through remote communications are not acceptable. Changing global strategies using firmware changes is also unacceptable.

5. Programming shall be object-oriented using control function blocks, and support DDC functions, 1000 Analog Values and 1000 Binary Values. All flowcharts shall be generated and automatically downloaded to controller. Programming tool shall be supplied and be resident on workstation. The same tool shall be used for all controllers.
6. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed using the operator's workstation or field computer.
7. Controller shall have sufficient memory to ensure high performance and data reliability. Battery shall provide power for orderly shutdown of controller and storage of data in nonvolatile flash memory. Battery backup shall maintain real-time clock functions for a minimum of 20 days.
8. Global control algorithms and automated control functions shall execute using 32-bit processor.

B. Schedules:

1. Each building controller module shall support a minimum of 80 BACnet Schedule Objects and 80 BACnet Calendar Objects.
2. Building controller modules shall provide normal seven-day scheduling, holiday scheduling and event scheduling.
3. Logging Capabilities

    a. Each building controller shall log as minimum 320 values. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
    b. Logs may be viewed both on-site or off-site using WAN or remote communication.
    c. Building controller shall periodically upload trended data to networked operator's workstation for long-term archiving if desired.
    d. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

C. Alarm Generation:

1. Alarms may be generated within the system for any object change of value or state (either real or calculated). This includes things such as analog object value changes, binary object state changes, and various controller communication failures.
2. Each alarm may be dialed out as noted elsewhere.
3. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.
4. Controller must be able to handle up to 320 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

D. Demand Limiting:

1. Demand limiting of energy shall be a built-in, user-configurable function. Each controller module shall support shedding of up to 200 loads using a minimum of two types of shed programs.
2. Load shedding programs in building controller modules shall operate as defined in section 2.3.J of this specification.

E. Tenant Activity Logging:

1. Tenant Activity logging shall be supported by building controller module. Each independent module shall support a minimum of 80 zones.
2. Tenant Activity logging shall function as defined in this specification.

F. Ethernet - MS/TP Module:

1. Ethernet - MS/TP Module shall support every function as listed under paragraph A, General Requirements, of this section and the following.

2. All communication with operator's workstation and all application controllers shall be through BACnet. Building controller Ethernet - MS/TP module shall incorporate as a minimum, the functions of a 2-way BACnet router. Controller shall route BACnet messages between the high-speed LAN (Ethernet 10/100MHz) and MS/TP LAN. Ethernet - MS/TP module shall also route messages from all other building controller modules onto the BACnet Ethernet network.

   a. MS/TP LAN must be software-configurable from 9.6 to 76.8Kbps.
   b. The RJ-45 Ethernet connection must accept either 10Base-T or 100Base-TX BACnet over twisted pair cable (UTP).

3. BACnet Conformance:

   a. Ethernet - MS/TP module shall, as a minimum, support MS/TP and Ethernet BACnet LAN types. It shall communicate directly using these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. Global controller shall be approved by the BACnet Testing Laboratory (BTL) as meeting the BACnet Building Controller requirements.
   b. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
   c. The building controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on WANs and CANs and function as a BACnet Broadcast Management Device (BBMD).

G. MS/TP Module:

1. MS/TP Module shall support every function as listed under paragraph A, General Requirements, of this section and the following.
2. Building controller MS/TP module communications shall be though BACnet MS/TP LAN to all advanced application and application-specific controllers. MS/TP module shall also route messages to Ethernet - MS/TP module for communication over WAN.

   a. MS/TP LAN must be software configurable from 9.6 to 76.8Kbps
   b. Configuration shall be through RS-232 connection.

3. BACnet Conformance:

   a. MS/TP module shall be approved by the BTL (BACnet Testing Laboratory) as meeting the BACnet Building Controller requirements. MS/TP module shall as a minimum support MS/TP BACnet LAN type. It shall communicate directly using this BACnet LAN as a native BACnet device and shall support simultaneous routing functions between all supported LAN types.
   b. Standard BACnet object types supported shall include, as a minimum, Analog Value, Binary Value, Calendar, Device, File, Group, Notification Class, Program, and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All

necessary tools shall be supplied for working with proprietary information.

H. Power Supply Module:

1. Power supply module shall power up to seven building controller modules. Input for power shall accept between 17-30VAC, 47-65Hz.
2. Power supply module shall include rechargeable battery for orderly shutdown of controller modules including storage of all data in flash memory and for continuous operation of real-time clocks for minimum of 20 days.

2.8 DAIKIN VRV SYSTEM

A. Integrate via BACNet over IP to variable refrigerant volume fan coils and condensing units via manufacturer provide BACnet protocol converter.

2.9 ENCLOSURES

A. All controllers, power supplies and relays shall be mounted in enclosures.

B. Enclosures may be NEMA 1 when located in a clean, dry, indoor environment. Indoor enclosures shall be NEMA 12 when installed in other than a clean environment.

C. Enclosures shall have hinged, locking doors.

D. Provide laminated plastic nameplates for all enclosures in any mechanical room or electrical room. Include location and unit served on nameplate. Laminated plastic shall be 0.125 inches (3 mm) thick and appropriately sized to make label easy to read.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Notify the owner's representative in writing of conditions detrimental to the proper and timely completion of the work.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding. Commencement of installation is considered acceptance of substrate conditions.

3.3 INSTALLATION (GENERAL)

A. Install in accordance with manufacturer's instructions.

B. Provide all miscellaneous devices, hardware, software, interconnections, installation, and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

3.4 LOCATION AND INSTALLATION OF COMPONENTS

A. Locate and install components for easy accessibility; in general, mount 48 inches above floor with minimum 3 feet (1 m) of clear access space in front of units. Obtain approval on locations from owner's representative prior to installation.

B. All instruments, including but not limited to switches and transmitters, shall be suitably wired and mounted to protect them from vibration, moisture, and high or low temperatures.

C. Identify all equipment and panels. Provide permanently mounted tags for all panels.

D. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections, and sized to suit pipe diameter without restricting flow.

3.5 INTERLOCKING AND CONTROL WIRING

A. Provide all interlock and control wiring. All wiring shall be installed neatly and professionally, in accordance with Specification Division 16 and all national, state and local electrical codes.

B. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Provide shielded low capacitance wire for all communications trunks.

C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the owner's representative prior to rough-in.

D. Provide auxiliary pilot duty relays on motor starters as required for control function.

E. Provide power for all control components from nearest electrical control panel or as indicated on the electrical drawings; coordinate with electrical contractor.

F. All control wiring in the mechanical, electrical, telephone and boiler rooms to be installed in raceways. All other wiring to be installed neatly and inconspicuously per local code requirements. If local code allows, control wiring above accessible ceiling spaces may be run with plenum-rated cable (without conduit).

3.6 DDC OBJECT TYPE SUMMARY

A. Provide all database generation.

B. Displays

1. System displays shall show all analog and binary object types within the system. They shall be logically laid out for easy use by the owner. Provide outside air temperature indication on all system displays associated with economizer cycles.

C. Run Time Totalization

1. At a minimum, run time totalization shall be incorporated for each monitored supply fan, return fan, exhaust fan, hot water and chilled water pumps. Warning limits for each point shall be entered for alarm and or maintenance purposes.

D. Trendlog

1. All binary and analog object types (including zones) shall have the capability to be

automatically trended.

E. Alarm

1. All analog inputs (High/Low Limits) and selected binary input alarm points shall be prioritized and routed (locally or remotely) with alarm message per owner's requirements.

F. Database Save

1. Provide backup database for all standalone application controllers on disk.

3.7 FIELD SERVICES

A. Prepare and start logic control system under provisions of this section.

B. Start up and commission systems. Allow sufficient time for startup and commissioning prior to placing control systems in permanent operation.

C. Provide the capability for off-site monitoring at control contractor's local or main office. At a minimum, off-site facility shall be capable of system diagnostics and software download. Owner shall provide phone line for this service for one year or as specified.

D. Provide owner's representative with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.

3.8 TRAINING

A. Provide application engineer to instruct owner in operation of systems and equipment.

B. Provide system operator's training to include (but not be limited to) such items as the following: modification of data displays, alarm and status descriptors, requesting data, execution of commands and request of logs. Provide this training to a minimum of three persons.

C. Provide on-site training above as required, up to 16 hours as part of this contract.

D. Provide tuition for at least one individual to attend for a one-week factory training class. If applicable, costs for travel, lodging and meals will be the responsibility of the owner.

3.9 DEMONSTRATION

A. Demonstrate complete operating system to owner's representative.

B. Provide certificate stating that control system has been tested and adjusted for proper operation.

C. Provide a complete and operational temperature control and building automation system based on the following points and sequence of operation. The system shall be complete as to sequences and standard control practices. The determined point list is the minimum amount of points that are to be provided. If additional points are required to meet the sequence of operation, they will be provided.

D. BACnet Object List:

1. The following points as defined for each piece of equipment are designated as follows:

a. Binary Out (BO): Defined as any two-state output (start/stop) (enable/disable), or other.

b. Binary In (BI): Defined as any two-state input (alarm, status), or other.
c. Analog In (AI): Defined as any variable input (temperature) (position), or other.
d. Analog Out (AO): Defined as any electrical variable output. 0-20mA, 4-20mA and 0-10VDC are the only acceptable analog outputs. The driver for analog outputs must come from both hardware and software resident in the controllers. Transducers will not be acceptable under any circumstance.
e. Analog Value (AV): Hardware points, software points, graphed as standard with manufacturer.

1) Hardware Points: AI, AO, BI, BO.
2) Software Points: AV, BV, Sched, Trend, Alarm.
3) Show on graphic.

3.10 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

MECHANICAL COMMISSIONING Section 23 09 80

PART 1 - GENERAL

1.1 SUMMARY

A. Commissioning is a designed process of documentation, training, adjustment, testing, and verification performed to ensure that the finished facility operates as intended. Provide complete and operational commissioned mechanical systems. The commissioning requirements specified in this section are in addition to the requirements specified in other sections of specifications for this project.

1.2 SECTION INCLUDES

A. This section includes the systematic process of commissioning for all sections of Division 23.

1. Commissioning Plan.
2. Commissioning Schedule.
3. Commissioning Basis of Design.
4. Commissioning One-Line Diagrams.
5. Code Compliance Verification.
6. Installation Verification.
7. Control Software Verification.
8. Start-Up Verification.
9. Test, Adjust, and Balance (TAB) Verification.
10. Commissioning Procedure.
11. Functional Performance Test.
12. Operations and Maintenance (O & M) Manuals Verification.
13. Owner Training Verification.
14. Seasonal Commissioning & Occupancy Variation

1.3 EQUIPMENT UTILIZED UNDER THIS SECTION

A. Provide the required instruments and components for measurements, verifications, and full commissioning of mechanical systems.

B. Calibrate the instruments and components in accordance with National Institute of Standards and Technology (NIST).

1.4 RELATED DIVISIONS

A. Related Divisions include Division 2, Division 22, Division 23 and Division 26.

1.5 REFERENCES

A. ASHRAE: American Society of Heating Refrigerating and Air Conditioning Engineers. The HVAC Commissioning Process ASHRAE Guidelines 1-1996.

B. NIST: National Institute of Standards and Technology.

C. NEBB: National Environmental Balancing Bureau Procedural Standards for building systems commissioning – latest edition.

D. AABC: Associated Air Balance Council. The AABC Commissioning Guideline.

1.6 QUALITY ASSURANCE

A. Commissioning Authority: The commissioning authority is the designated company that implements the overall commissioning.

B. Test Engineer: The Test Engineer is the person employed by the Commissioning Authority who actually performs the test. The Test Engineer shall have a minimum of two years of experience in Commissioning and a minimum of two years of experience in start-up of similar mechanical systems specified in this project. Obtain prior approval. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

C. Commissioning Agent: The commissioning agent is the person employed by the commissioning authority who oversees the commissioning process and assures coordination with other trades. The commissioning agent shall have a minimum of two years of experience in commissioning and minimum two years of experience in start-up of similar mechanical systems. Obtain prior approval. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

1.7 COORDINATION

A. Coordination and management: Provide overall coordination and management of the commissioning program. The commissioning team shall be comprised of: contractors, subcontractors, commissioning authority, and owner representatives.

B. Assure all applicable forms are submitted and are complete for each section of Division 23. The commissioning performed under this section is in addition to commissioning performed by the manufacturer and contractors for each section of Division 23 or each piece of equipment.

1.8 QUALITY ASSURANCE FOR CONTRACTOR'S SHOP DRAWINGS

A. The shop drawings shall be reviewed and approved by the commissioning authority prior to construction. Assure proper coordination between trades. Assure proper access for service. Review and discuss at monthly commissioning meetings.

B. Assure the electrical requirements of the actual equipment supplied by mechanical contractor are verified, reviewed, and coordinated with electrical and other trades. Review and discuss at monthly commissioning meetings.

C. A copy of all mechanical submittals shall be submitted to commissioning authority for review, reference, and coordination.

1.9 SUBMITTALS

A. Commissioning Quality Assurance: Submit qualification years of experience, certifications, resumes and company profile.

1. Commissioning Authority qualifications and certifications.
2. Test Engineer qualifications.
3. Commissioning Agent qualifications.

B. General: Submit the following in accordance with general and supplemental conditions of the contract and Division 1 specification sections. Submit a comprehensive and detailed commissioning package within thirty (30) days upon authorization to proceed. The commissioning package shall include all the required submittal items, plans, forms, schedules, and procedures in a 3-ring binder with a detailed table of contents. Upon completion of the commissioning process, resubmit the entire commissioning package along with results, certified forms, and requirements.

1. Commissioning Plan.
2. Commissioning Schedule.
3. Commissioning Basis of Design.
4. Commissioning One-Line Diagrams.
5. Code Compliance Verification.
6. Installation Verification.
7. Control Software Verification.
8. Start-Up Verification.
9. Test, Adjust, and Balance (TAB) Verification.
10. Commissioning Procedure.
11. Functional Performance Test.
12. Operations and Maintenance (O & M) Manuals Verification.
13. Owner Training Verification.
14. Commissioning Authority Qualifications.
15. Test Engineer Qualifications.
16. Commissioning Agent Qualifications.

1.10 COMMISSIONING MEETINGS

A. Schedule, organize, and coordinate commissioning meetings. The commissioning agent shall lead these meetings. Request attendance of the owner and end-users, and owner's maintenance/staff. Provide a comprehensive agenda to all participants seven calendar days prior to each meeting. Compile and distribute meeting minutes to all participants within seven calendar days after each meeting. The construction coordination meetings by the general contractor are not a substitution for a commissioning meeting. Commissioning meetings shall be conducted in addition to the construction coordination meetings.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Provide test equipment, instruments, components, and tools as required for a complete commissioning of the mechanical system.

2.2 QUALITY CONTROL

A. Verify that equipment is calibrated properly in conformance with National Institute of Standards and Technology (NIST) and NEBB requirements.

PART 3 - EXECUTION

3.1 COMMISSIONING PLAN

A. Develop a commissioning plan and identify all commissioning activities. The intent of the commissioning plan is to expose all critical issues and resolve them with input from the construction team at early stages of planning.

B. Identify responsible parties for producing various procedures, reports, Owner Notifications, and forms. Discuss and confirm at monthly commissioning meetings.

C. Describe the testing and acceptance method for each system. Provide applicable forms. Complete forms to assure acceptable compliance.

D. Clearly identify each subcontractor's responsibilities and participation in each test.

E. Clearly identify instruments for each test.

F. Provide an operational description, defining design criteria, design intent, code requirements, specifics of the equipment to be provided, sequence of operation, operating priorities, and protocols.

G. 72 Hour Trend Data: Provide 72 hour trend data of all DDC points utilizing the building automation system in accordance with "HVAC Instrumentation and Controls" Section 230900. The trend data shall verify the proper operation of all components, equipment and the system. Coordinate with the building automation contractor. Provide separate 72 hour trend data report for heating and cooling modes.

H. Review the sequence of operation in detail. Assure there is a meaningful plan for implementation. Verify the sequence of operation meets the owner's use requirements. Review and discuss at monthly commissioning meeting.

I. Request a list of all mechanical equipment with potential for excessive noise and vibration. Field verify the actual location of these equipment. Review and discuss at monthly commissioning meetings.

J. Field verify and review the outside air intake openings to the building. Examine the approximate exhaust air discharge and plumbing vents. Review and discuss at monthly commissioning meetings.

K. Request a list of all mechanical equipment and controllers that require emergency power supply. Verify compliance. Review and discuss at commissioning meetings.

L. Coordinate the entire commissioning plan with control subcontractor and other trades.

3.2 COMMISSIONING SCHEDULE

A. Integrate functional performance testing and commissioning requirements into the Critical Path Method (CPM) master construction schedule.

1. Prior to the beginning of start-up or functional performance testing activities, update the schedule of commissioning activities.
2. Two weeks prior to the beginning of start-up or functional performance testing activities, provide a detailed two-week look-ahead schedule. The two-week look-ahead schedule shall identify the date, time, beginning location, contractor personnel required, and anticipated duration for each start-up or test activity.

B. Commissioning of systems shall proceed per the criteria established in the specific sections that follow with activities to be performed on a timely basis. Commissioning of systems may proceed prior to final completion of systems. The Test Engineer must be available to respond promptly to avoid delay to the CPM Schedule.

C. Problems observed shall be addressed immediately in terms of notification to responsible parties and the engineer. Take actions to correct deficiencies.

D. Coordination with Owner's Representatives:

1. The commissioning authority shall notify Owner's Representative when start-up and test activities are to take place.
2. Notify the Owner's Representative in writing of the date, time, location, and anticipated duration of start-up and test activities as required in schedule above.
3. Provide written timely notice to Owner's Representative of any changes in date, time, location or anticipated duration of start-up, and test activities. A minimum of 72 hours in advance is required.

E. Provide a complete and comprehensive schedule for commissioning. Present this schedule in a Microsoft Project format. Coordinate with all parties.

3.3 COMMISSIONING BASIS OF DESIGN

A. Prepare commissioning basis of design narratives. Incorporate the effect of approved substitution requests, change orders and responses to requests for clarifications. Basis of design includes design criteria and operation descriptions for systems.

1. Design criteria shall include design conditions for each space as follows: indoor dry bulb temperature; indoor relative humidity; outdoor dry bulb temperature; outdoor wet bulb temperature; occupancy and hours.

2. Operations description shall include design intent, basic system type, capacity and sizing criteria, redundancy, diversity, automatic temperature control and sequence of operation, intended operation under all seasonal loads, changeover procedures, part-load strategies, occupied/unoccupied modes of operation, design setpoints of control systems with permissible adjustments, operation of system components in life-safety modes, energy conservation procedures, and any other engineered operational mode of the systems.
3. Review the construction documentation detail. Provide a narrative indicating anticipated issues that may impact start-up, test and balance, and commissioning process.

B. Prepare and update final commissioning basis of design incorporating any changes to the system, equipment, etc. that took place during construction, start-ups, functional testing, etc.

3.4 COMMISSIONING ONE-LINE DIAGRAMS

A. Provide commissioning one-line diagrams. Incorporate the effect of approved substitution requests, change orders and responses to requests for clarifications. One-line diagrams shall include, but not be limited to; air distribution and hydronic flow as well as control schematics.

1. Provide one-line diagrams for the HVAC supply and return air system. Indicate the specified CFM for each zone. Verify the overall routing and balancing criteria.
2. Provide one-line diagrams for CHW, HW and other mechanical systems. Verify the overall balancing scheme.
3. One-line diagrams are intended to support narrative system descriptions, commissioning Basis of Design, and the overall commissioning process.
4. Examine the construction site to assure proper passage for return air in accordance with the one-line diagram.
5. Verify the overall building pressurization scheme in reference to outside air, supply air and exhaust air.

3.5 CODE COMPLIANCE VERIFICATION

A. Review the contractor's shop drawings, generate a report and assure full compliance with California Mechanical Code (CMC), California Plumbing Code (CPC), and National Fire Protection Agency (NFPA), as well as other governing codes. There shall be no exception. Report deficiencies prior to ordering and installing materials. Verify installation compliance upon completion of the project. Verify completion of all required sign offs from regulatory agencies.

3.6 INSTALLATION VERIFICATION

A. Observation Reports: During construction, observe the work of the prime HVAC and plumbing contractors and subcontractors to ensure that all installations are being made in accordance with the intent of the contract documents. Provide a one page "HVAC Commissioning Observation Report" and a one page "Plumbing Observation Report". Present these at the commissioning meeting.

B. Before system start-up begins, conduct, document and publish a final installation verification audit/report for both mechanical and plumbing installations. The audit shall include, but not be limited to, a check of:

1. Piping specialties including balance, control, and isolation valves.
2. Ductwork specialty items including turning devices, balance, fire, smoke, and control dampers, and access doors.
3. Control sensor types and locations.
4. Identification of piping, valves, starters, gauges, and thermometers.
5. Documentation of prestart-up tests performed.
6. Report deficiencies in regards to any non-ducted supply/return air pathways that may be obstructed by walls or other obstacles.

C. Verify that the plumbing installation meet the specified guidelines and applicable codes. This, as a minimum, shall include the following:

1. Verification of proper access to plumbing components and valves.
2. Verification of proper labeling of pipes and components.
3. Verification of successful completion of specified tests.
4. Verification of compliance with CPC and ADA requirements.

D. If any work is found to be incomplete, inaccessible, incorrect, or non-functional, make note of deficiencies, report and correct the deficiencies before system start-up work proceeds.

E. Upon installation of all equipment, devices, vibration isolators, etc., provide a written confirmation from manufacturer's representative indicating such devices are installed and operating within manufacturer's recommendations and tolerances.

3.7 CONTROL SOFTWARE VERIFICATION

A. Verify all the required graphic presentations are completed.

B. Verify the room numbers are updated and correct.

C. Verify the equipment numbering methods are conducted and meet the facility standards.

D. Verify that a graphic presentation is shown in each zone.

E. Verify compatibility and compliance with other equipment as specified.

F. Verify interface with other systems where specified.

G. Verify proper software applications for 72-hour trending.

H. Verify proper programming for the sequence of operation.

I. Verify proper software licenses are provided to the owner.

J. Provide a compliance report confirming the results of control software verification as described herein.

3.8 START-UP VERIFICATION

A. Verify that the start-up procedures recommended by manufacturers are coordinated.

B. Coordinate and notify Owner of start-up activities. Schedule at least three working days in advance. Commissioning Authority shall physically witness start-up procedures.

C. Verify that start-up deficiency list forms are prepared to report deficiencies discovered in conjunction with system start-up. Start-up deficiency forms shall indicate the system being started-up; the location and identification of the deficient equipment/material; date of observation; initials of the observer; observed deficiency; date of correction; initials of person making the correction; and corrective action taken.

D. Issue start-up deficiency report forms to the Contractor for corrective action. Assure and document that all start-up deficiency list items have been corrected. Document compliance.

3.9 TEST, ADJUST, AND BALANCE (TAB) VERIFICATION

A. Coordinate with air and hydronic balancing contractor. Advise the TAB firm when systems are complete and ready for balancing.

B. Field verify the conditions above ceiling before ceiling tiles are installed.

C. Verify the completion of the TAB work prior to commencing any Functional Performance Test (FPT) activities that may be adversely affected by improper balancing.

D. Randomly check the air and hydronic balancing at the presence of the owner's representative and the mechanical engineer. Document compliance.

3.10 COMMISSIONING PROCEDURE

A. Sequence of Testing: Commissioning shall proceed from lower to higher levels of complexity. In general, the order of testing from lowest to highest is:

1. Component functional performance tests (of motors, actuators, sensors, VFD's, etc.) and start-up.
2. Equipment functional performance tests (safety devices, low load conditions, etc.).
3. Subsystems functional performance tests.
4. System functional performance tests.

B. Retesting: Repeat, at no additional cost to the owner, the complete functional test procedure for each test for which acceptable results are not achieved. Repeat test until acceptable results are achieved. Fill out a new functional performance test data form for each retest.

C. Testing of VFD's: Assure that all the VFD's are tested and balanced by the factory and test and balance company. Verify that unstable frequency ranges are by-passed. Perform random testing to verify. Assure final settings are accurate.

D. Assure that the commissioning performed by the mechanical contractor and equipment manufacturer for other sections of Division 23 are in conformance with specified requirements.

E. Correction of Deficiencies:

1. Correct functional performance test deficiencies promptly and schedule retest.
2. Corrections during functional performance test are generally prohibited to avoid consuming the time of personnel waiting for the test, but not involved in making the

correction. Exceptions will be allowed if the cause of the failure is obvious and corrective action can be completed in less than five minutes.

F. Owner's Witnesses: Witnesses will be designated by the Owner to observe the commissioning process. Owner's witnesses shall provide no labor or materials in the commissioning process. The only function of the Owner's witnesses shall be to observe and comment on the progress and results of commissioning.

3.11 FUNCTIONAL PERFORMANCE TEST

A. Initiate, develop, and document functional performance test procedures. Include functional performance test procedures data sheets for each component, equipment and the system. Determine actual system performance and compliance with the design. Personnel experienced in the technical aspects of each system to be commissioned shall be engaged.

B. Test procedures shall fully describe system configuration and steps required for each test and be appropriately documented so that another party can repeat the tests with virtually identical results.

C. Acceptance test procedures must confirm the performance of systems. Comply with the requirements of the contract documents. The acceptance test shall meet the design intent and applicable code under which the project was permitted. When a system is accepted, the Commissioning Authority must be assured that the system is complete, works as intended, is correctly documented, and that the Owner's staff is trained in the operation and maintenance of the system.

D. The mechanical equipment requires integral safety devices to stop/prevent equipment operation unless minimum safety standards or conditions are met. This shall include adequate oil pressure, proof-of-flow, non-freezing conditions, and maximum head pressure. Functional performance test procedures shall demonstrate the actual performance of safety shutoffs in real or closely-simulated conditions of failure. Document compliance.

E. Notify all personnel on the project site prior to any start-up or testing which may create a hazardous or dangerous condition. Coordinate with other trades.

1. Functional Performance Test (FPT) Procedures:

   a. Each procedure shall have a unique alphanumeric designator.
   b. The same procedure may be applied to multiple identical pieces of equipment or systems.
   c. Procedures shall reference the applicable specification section upon which the procedure is based.
   d. These procedures will be reviewed for technical depth, clarity of documentation, and compliance with acceptance criteria.
   e. Identify the value for all setpoints and inputs, positions of adjustable devices, including valves, dampers, and switches.
   f. Identify the range of acceptable results for each condition tested.
   g. FPT procedures shall be detailed test instructions, written with sufficient step-by-step information to allow a test to be repeated under identical conditions with repeatable results.

2. Functional Performance Test (FPT) Data Forms:

a. Identify each functional performance test data form by a unique designator consisting of the applicable functional performance test procedure designator followed by a dash digit suffix to distinguish multiple repetitions of the same procedure.

b. Include space to record the following: description of the procedure; whether the form is for a retest of a failed procedure; identification and location of the equipment being tested; identification of instrumentation used by serial number; observed conditions at each step of the procedure; acceptable results as specified elsewhere; date of the test; names of technicians performing the procedure; name and signature of the Test Engineer; and name and signature of the Commissioning Authority or Owner-designated witness. Signature of witness shall only indicate concurrence with reported results and observations. Acceptance of the results will be reported separately by the Commissioning Authority after review of the FPT data forms.

3. Functional Performance Test Deficiency Report Forms: Include space to record the following: Associated functional performance test data form number; date of test; name of person reporting the deficiency; description of the observations associated with the failure of the test; cause of the failure, if apparent at the time of the test; date and description of corrective action taken; name and signature of person taking corrective action; and schedule for retest.

F. Verify proper operation of LON, LAN, or gateway connections to VFD's and other equipment. Verify that all the required information is actually available at the operator's station.

3.12 OPERATIONS AND MAINTENANCE (O & M) MANUALS VERIFICATION

A. Review, verify and approve the accuracy of O & M manuals of the work related to commissioning for compliance with the requirements of Division 1 and Division 23.

B. Assure O & M manuals are concise, to the point, and tailored specifically to this facility.

C. Assure O & M manuals include standard technical literature relevant to the operation and maintenance of the provided equipment. The literature shall be specifically oriented to the equipment provided, indicating all operation and maintenance procedures, parts lists, assembly/disassembly diagrams, and related information. Wiring diagrams must be complete and specific to the equipment provided. Document compliance.

3.13 OWNER TRAINING VERIFICATION

A. The purpose of owner training verification is to assure coordination between various sections of Division 23 and to assure the owner's appropriate personnel receive adequate training. In addition to the training specified under other sections of Division 23, provide 40 hours of total building operation training for mechanical systems.

B. Coordinate and provide a master training schedule for all Division 23 training requirements for components, equipment, and systems. Present the master training schedule in a Microsoft Office program. Assure training is provided for all critical items. Assure the presenters are qualified. Verify the competency of the owner operators. The training plan shall include the following for each training session:

1. Dates, start and finish times, and locations.

2. Outline of the information to be presented.
3. Names and qualifications of presenters.
4. List of texts and other materials required to support training.
5. Names and positions of those attending.

C. Obtain assistance from appropriate subcontractors and vendors to provide training for the Owner's operations staff.

D. Provide videotape documentation of training of the Owner's staff for each system. Training shall be in a classroom setting with the appropriate schematics, hand-outs, and audio/visual training aids. A copy of the training videotape shall be included in the final commissioning report.

E. Catalog all training videotapes and deliver to the Owner with the O & M manuals.

F. Host each training session:

1. Provide program overview and curriculum guidance.
2. Obtain signatures of attendees on a sign-in list.

G. Equipment vendors shall provide training on the specifics of each system and philosophy, troubleshooting, and repair techniques as specified in the relevant sections of this specification.

H. Installation subcontractors shall provide training on peculiarities specific to this project and job specific experience as specified in the relevant sections of this specification.

I. Verify emergency procedures and verify disaster recovery plans. Emergency procedures have been provided in the training sessions.

END OF SECTION

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS — Section 23 09 93

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

B. Related Sections include the following:

1. Division 01 Section for LEED Requirements.
2. Division 01 Section 01 91 00 "General Commissioning Requirements."
3. Division 23 Section 23 09 80 "Mechanical Commissioning."
4. Division 23 Section 23 09 00 " HVAC Instrumentation and Controls" for control equipment and devices and submittal requirements.

1.3 SUBMITTALS

A. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

B. Submit detailed sequence of operation for each piece of equipment with the control drawings.

1.4 DEFINITIONS

A. DDC: Direct-digital controls.

1.5 EXHAUST FAN CONTROL

A. Provide DDC status and alarm for each exhaust fan. Switch EF-1 with 0 to 2 hour timer wall switch (manually set VFD for constant speed operation). Switch EF-2, 3 and 4 with 0 to 2 hour timer wall switch. EF-5 shall run continuously (shut off EF-5 via DDC output).

1.6 POWERED FILTRATION CONTROL

A. Provide DDC status and alarm for each powered filtration fan. Control each PF-1 on/off via a central TCMM timer control system panel with a carbon monoxide (CO) sensor located in each apparatus bay.

1.7 SPLIT SYSTEM VARIABLE REFRIGERANT FLOW (VRF) HEAT RECOVERY UNIT

A. Provide control using electric actuation with a programmable thermostat or control panel. Provide DDC alarm input for each unit. Each VRF FC unit programmable thermostat controller shall energize the associated VRF condensing unit to provide heating or cooling via the VRF control system.

B. Each VRF system shall operate continuously.

C. Each VRF system shall operate as follows:

1. The fan starts or continues to run and the unit is controlled as follows:

a. Cooling: Upon a call for cooling, the cooling mode is enabled to satisfy space-cooling load. When the space-cooling load is satisfied, the cooling mode is disabled.
b. Heating – upon a call for heating, the heating mode is enabled to satisfy space – heating load. When the space-heating load is satisfied, the heating mode is disabled.

D. Operator Station Display: Indicate the following on operator workstation display terminal (minimum requirements):

1. System graphic(s) with alarm(s).

1.8 SPLIT SYSTEM COOLING ONLY UNIT

A. Provide control using electric actuation with a programmable thermostat or control panel. Provide DDC alarm input for each unit.

B. Each SS unit shall operate continuously.

C. Each SS unit shall operate as follows:

1. The fan starts or continues to run and the unit is controlled as follows:

a. Cooling: Upon a call for cooling, the cooling mode is enabled to satisfy space-cooling load. When the space-cooling load is satisfied, the cooling mode is disabled.

D. Operator Station Display: Indicate the following on operator workstation display terminal (minimum requirements):

1. System graphic(s) with alarm(s).

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

FACILITY FUEL-OIL PIPING Section 23 11 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes diesel-fuel-oil distribution systems and the following:

1. Pipes, tubes, and fittings.
2. Piping and tubing joining materials.
3. Piping specialties.
4. Valves.
5. Horizontal, steel, fuel-oil ASTs.
6. Insulated, steel, fuel-oil ASTs.
7. Concrete-vaulted, steel, fuel-oil ASTs.
8. Fuel-oil AST accessories.
9. Fuel-oil UST accessories.
10. Fuel-oil storage tank piping specialties.
11. Fuel maintenance system.
12. Liquid-level gage system.
13. Leak-detection and monitoring system.
14. Concrete bases.

1.3 DEFINITIONS

A. AST: Aboveground storage tank.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

D. FPM: Vinylidene fluoride-hexafluoropropylene copolymer rubber.

E. FRP: Glass-fiber-reinforced plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Maximum Operating-Pressure Ratings: 3-psig (21-kPa) fuel-oil supply pressure at oil-fired appliances.

B. Delegated Design: Design restraint and anchors for fuel-oil piping, ASTs, and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Seismic Performance: Factory-installed support attachments for AST shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, and dimensions of individual components and profiles. Also include, where applicable, rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1. Piping specialties.
2. Valves: Include pressure rating, capacity, settings, and electrical connection data of selected models.
3. Each type and size of fuel-oil storage tank. Indicate dimensions, weights, loads, components, and location and size of each field connection.
4. Fuel-oil storage tank accessories.
5. Fuel-oil storage tank piping specialties.
6. Fuel-oil storage tank pumps.
7. Fuel maintenance system.
8. Liquid-level gage system.
9. Leak-detection and monitoring system.

B. Shop Drawings: For facility fuel-oil piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: 1/4 inch per foot (1:50).
2. For fuel-oil storage tanks and pumps, include details of supports and anchors.

C. Delegated-Design Submittal: For fuel-oil piping and equipment 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 anchors and seismic restraints.
2. Design Calculations: Calculate requirements for selecting seismic restraints.
3. Detail fabrication and assembly of pipe anchors, hangers, supports for multiple pipes, and attachments of the same to building structure.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and details, drawn to scale, on which fuel-oil piping is shown and coordinated with other installations, using input from installers of the items involved.

B. Site Survey: Plans, drawn to scale, on which fuel-oil piping and tanks are shown and coordinated with other services and utilities.

C. Qualification Data: For qualified professional engineer.

D. Seismic Qualification Certificates: For ASTs, 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.

E. Brazing certificates.

F. Welding certificates.

G. Field quality-control reports.

H. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-oil equipment and accessories to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

B. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

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

E. Comply with ASME B31.9, "Building Services Piping," for fuel-oil piping materials, installation, testing, and inspecting.

F. Comply with requirements of the EPA and of state and local authorities having jurisdiction. Include recording of fuel-oil storage tanks and monitoring of tanks and piping.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Lift and support fuel-oil storage tanks only at designated lifting or supporting points, as shown on Shop Drawings. Do not move or lift tanks unless empty.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store pipes and tubes with protective PE coating to avoid damaging the coating and to protect from direct sunlight.

D. Store PE pipes and valves protected from direct sunlight.

1.10 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-oil storage tanks and flexible, double-containment piping and related equipment that fail in materials or workmanship within specified warranty period.

1. Storage Tanks:

a. Failures include, but are not limited to, the following when used for storage of fuel oil at temperatures not exceeding 150 deg F (66 deg C):

1) Structural failures including cracking, breakup, and collapse.
2) Corrosion failure including external and internal corrosion of steel tanks.

b. Warranty Period: 30 years from date of Substantial Completion.

2. Flexible, Double-Containment Piping and Related Equipment:

a. Failures due to defective materials or workmanship for materials installed together, including piping, dispenser sumps, entry boots, and sump mounting adapters.
b. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. See Part 3 piping schedule articles for where pipes, tubes, fittings, and joining materials are applied in various services.

B. Rigid, Double-Containment Piping: Comply with UL 971.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ameron International; Fiberglass Pipe Group.
b. Conley Corporation.

c. Perma-Pipe, Inc.
d. Smith Fibercast.

2. RTRP: ASTM D 2996 or ASTM D 2997 carrier and containment piping and mechanical couplings to seal carrier and containment piping or individually bonded joints.

a. Minimum Operating-Pressure Rating for RTRP NPS 2 and NPS 3 (DN 50 and DN 80): 150 psig (1035 kPa).
b. Minimum Operating-Pressure Rating for RTRP NPS 4 and NPS 6 (DN 100 and DN 150): 125 psig (860 kPa). Compliance with UL 971 is not required for NPS 6 (DN 150) and larger piping.
c. Fittings: RTRF complying with ASTM D 2996 or ASTM D 2997, and made by RTRP manufacturer; watertight sump entry boots, termination, or other end fittings.

3. Include design and fabrication of double-containment pipe and fitting assemblies with provision for field installation of cable leak-detection system in annular space between carrier and containment piping.

2.2 PIPING SPECIALTIES

A. Flexible Connectors: Comply with UL 567.

1. Metallic Connectors:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Flexicraft Industries.
2) Metraflex Company (The).
3) Or approved equal.

b. Listed and labeled for aboveground and underground applications by an NRTL acceptable to authorities having jurisdiction.
c. Stainless-steel bellows with woven, flexible, bronze or stainless-steel, wire-reinforcing protective jacket.
d. Minimum Operating Pressure: 150 psig (1035 kPa).
e. End Connections: Socket, flanged, or threaded end to match connected piping.
f. Maximum Length: 30 inches (762 mm.)
g. Swivel end, 50-psig (345-kPa) maximum operating pressure.
h. Factory-furnished anode.

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.

3. Strainer Screen: 80-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (860 kPa).

C. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 80-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (860 kPa).

D. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 80-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig (5170 kPa).

E. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2 (DN 15).
5. Discharge Connection: NPS 1/8 (DN 6).
6. CWP Rating: 150 psig (1035 kPa).
7. Maximum Operating Temperature: 225 deg F (107 deg C).

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for fuel oil.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

D. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.

2.4 MANUAL FUEL-OIL SHUTOFF VALVES

A. See valve schedule in Part 3 for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller for Liquid Service: Comply with UL 842.

1. CWP Rating: 125 psig (860 kPa).
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in the valve schedule.
5. Service Mark: Initials "WOG" shall be permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 (DN 65) and Larger: Comply with UL 842.

1. CWP Rating: 125 psig (860 kPa).
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in the valve schedule.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

2.5 SPECIALTY VALVES

A. Pressure Relief Valves: Comply with UL 842.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Anderson Greenwood; Division of Tyco Flow Control.
   b. Fulflo Specialties, Inc.
   c. Webster Fuel Pumps & Valves; a division of Capital City Tool, Inc.

2. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
3. Body: Brass, bronze, or cast steel.
4. Springs: Stainless steel, interchangeable.
5. Seat and Seal: Nitrile rubber.
6. Orifice: Stainless steel, interchangeable.
7. Factory-Applied Finish: Baked enamel.
8. Maximum Inlet Pressure: 150 psig (1035 kPa).
9. Relief Pressure Setting: 60 psig (414 kPa).

B. Oil Safety Valves: Comply with UL 842.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Anderson Greenwood; Division of Tyco Flow Control.
   b. Suntec Industries Incorporated.
   c. Webster Fuel Pumps & Valves; a division of Capital City Tool, Inc.

2. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
3. Body: Brass, bronze, or cast steel.
4. Springs: Stainless steel.
5. Seat and Diaphragm: Nitrile rubber.
6. Orifice: Stainless steel, interchangeable.
7. Factory-Applied Finish: Baked enamel.
8. Manual override port.

9. Maximum Inlet Pressure: 60 psig (414 kPa).
10. Maximum Outlet Pressure: 3 psig (21 kPa).

C. Emergency Shutoff Valves: Comply with UL 842.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ameron International; Fiberglass Pipe Group.
   b. Conley Corporation.
   c. EMCO Wheaton; a Gardner Denver Company.
   d. Environ Products, Inc.
   e. OPW.

2. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
3. Double poppet valve.
4. Body: ASTM A 126, cast iron.
5. Disk: FPM.
6. Poppet Spring: Stainless steel.
7. Stem: Plated brass.
8. O-Ring: FPM.
9. Packing Nut: PTFE-coated brass.
10. Fusible link to close valve at 165 deg F (74 deg C).
11. Thermal relief to vent line pressure buildup due to fire.
12. Air test port.
13. Maximum Operating Pressure: 0.5 psig (3.45 kPa).

D. Mechanical Leak Detector: Comply with UL 842.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. FE Petro, Inc.
   b. Red Jacket Pumps; a division of Veeder-Root.
   c. Or approved equal.

2. Listed and labeled for fuel-oil service by an NRTL acceptable to authorities having jurisdiction.
3. Body: ASTM A 126, cast iron.
4. O-Rings: Elastomeric compatible with fuel oil.
5. Piston and Stem Seals: PTFE.
6. Stem and Spring: Stainless steel.
7. Piston Cylinder: Burnished brass.
8. Indicated Leak Rate: Maximum 3 gph (3 mL/s) at 10 psig (69 kPa).
9. Leak Indication: Reduced flow.

2.6 CONCRETE-VAULTED, STEEL, FUEL-OIL AST

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Industrial Fabricators, Inc. Supervault MH Model MH-D1-250.

2. Or approved equal.

B. Description: UL 142 and UL 2085; thermally insulated, fire-resistant and protected, double-wall, horizontal, steel tank; with primary- and secondary-containment walls and insulation and with interstitial space.

C. Construction: Fabricated with welded, carbon steel and insulation and encased in concrete that will protect from bullets; suitable for operation at atmospheric pressure and for storing fuel oil with specific gravity up to 1.1 and with test temperature according to UL 2085.

D. Capacities and Characteristics:

1. Capacity: 250 gal.
2. Diameter: 37.25 inches.
3. Length: 60 inches.
4. Connection Sizes:

a. Fill Line: 4 NPS.
b. Vent Line: 2 NPS.
c. Outlet: 2 NPS.
d. Return: 2 NPS.
e. Gage: 2 NPS.

5. Fuel-Oil Grade Number: 2

2.7 FUEL-OIL AST ACCESSORIES

A. Threaded pipe connection fittings on top of tank, for fill, supply, return, vent, sounding, and gaging. Include cast-iron plugs for shipping.

B. Striker Plates: Inside tank, on bottom below fill, vent, sounding, gage, and other tube openings.

C. Lifting Lugs: For handling and installation.

D. Supply Tube: Extension of supply piping fitting into tank, terminating 6 inches (150 mm) above tank bottom and cut at a 45-degree angle (1:1 slope).

E. Sounding and Gage Tubes: Extension of fitting into tank, terminating 6 inches (150 mm) above tank bottom and cut at a 45-degree angle (1:1 slope).

2.8 FUEL-OIL STORAGE TANK PIPING SPECIALTIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Industrial Metal Fabricators
2. Or approved equal.

B. Fitting Materials: Cast iron, malleable iron, brass, or corrosion-resistant metal; suitable for fuel-oil service.

1. Surface, Flush-Mounted Fittings: Waterproof and suitable for truck traffic.

2. Aboveground-Mounted Fittings: Weatherproof.

C. Spill-Containment Fill Boxes: Flush mounting, with drainage feature to drain oil into tank, threaded fill-pipe connection, and wrench operation.

D. Fill Boxes: Flush mounting, with threaded fill-pipe connection and wrench operation.

E. Locking Fill Boxes: Flush mounting, with locking-type inner fill cap for standard padlock and threaded fill-pipe connection.

F. Supply and Sounding Drop Tubes: Fuel-oil supply piping or fitting, inside tank, terminating 6 inches (150 mm) above bottom of tank, and with end cut at a 45-degree angle (1:1 slope).

G. Pipe Adapters and Extensions: Compatible with piping and fittings.

H. Suction Strainers and Check Valves: Bronze or corrosion-resistant metal components.

I. Foot Valves and Antisiphon Valves: Poppet-type, bronze or corrosion-resistant metal components.

J. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

K. Monitoring Well Caps: Locking pipe plug and manhole.

2.9 LIQUID-LEVEL GAGE SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Industrial Metal Fabrications, Inc.
2. Or approved equal.

B. Description: Calibrated, liquid-level gage system complying with UL 180 with floats or other sensors and remote annunciator panel.

C. Annunciator Panel: With visual and audible, high-tank-level and low-tank-level alarms, fuel indicator with registration in gallons (liters), and overfill alarm. Include gage volume range that covers fuel-oil storage capacity.

D. Controls: Electrical, operating on 120-V ac.

2.10 FUEL OIL

A. Fuel Oil: ASTM D 396, Grade No. 2.

B. Diesel Fuel Oil: ASTM D 975, Grade No. 2-D, general-purpose, high volatility.

2.11 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (152 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (762 mm) deep; colored yellow.

2.12 SOURCE QUALITY CONTROL

A. Pressure test and inspect fuel-oil storage tanks, after fabrication and before shipment, according to ASME and the following:

1. Horizontal, Double-Wall Steel ASTs: UL 142, STI F921, and STI R931.
2. Horizontal, Containment-Dike, Steel ASTs: UL 142 and STI F911.
3. Horizontal, Concrete-Vaulted and Insulated, Steel ASTs: UL 142 and UL 2085.

B. Affix standards organization's code stamp.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for fuel-oil piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

A. Comply with requirements in Section 31 20 10 "Earthwork" for excavating, trenching, and backfilling.

3.3 PREPARATION

A. Close equipment shutoff valves before turning off fuel oil to premises or piping section.

B. Comply with NFPA 30 and NFPA 31 requirements for prevention of accidental ignition.

3.4 INDOOR 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, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

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 free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Verify final equipment locations for roughing-in.

I. Comply with requirements for equipment specifications in plumbing and HVAC Sections for roughing-in requirements.

J. Conceal pipe installations in walls, pipe spaces, or utility spaces; above ceilings; below grade or floors; and in floor channels unless indicated to be exposed to view.

K. Prohibited Locations:

1. Do not install fuel-oil piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
2. Do not install fuel-oil piping in solid walls or partitions.

L. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

M. Connect branch piping from top or side of horizontal piping.

N. Install unions in pipes NPS 2 (DN 50) and smaller at final connection to each piece of equipment and elsewhere as indicated. Unions are not required on flanged devices.

O. Do not use fuel-oil piping as grounding electrode.

P. Install Y-pattern strainer on inlet side of fuel-oil pump.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.5 VALVE INSTALLATION

A. Install manual fuel-oil shutoff valves on branch connections to fuel-oil appliance.

B. Install valves in accessible locations.

C. Protect valves from physical damage.

D. Install metal tag attached with metal chain indicating fuel-oil piping systems.

E. Identify valves as specified in Section 230553 "Identification for HVAC Piping and Equipment."

F. Install oil safety valves at inlet of each oil-fired appliance.

G. Install pressure relief valves in distribution piping between the supply and return lines.

H. Install one-piece, bronze ball valve with hose end connection at low points in fuel-oil piping.

I. Install manual air vents at high points in fuel-oil piping.

J. Install emergency shutoff valves at dispensers.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Bevel plain ends of steel pipe.
2. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness for service application. Install gasket concentrically positioned.

G. Flared Joints: Comply with SAE J513. Tighten finger tight, then use wrench according to fitting manufacturer's written recommendations. Do not overtighten.

3.7 FUEL-OIL AST INSTALLATION

A. Install tank bases and supports.

B. Connect piping and vent fittings.

C. Install ground connections.

D. Install tank leak-detection and monitoring devices.

E. Install steel ASTs according to STI R912.

F. Install insulated and concrete-vaulted, steel ASTs according to STI R942.

G. Fill storage tanks with fuel oil.

3.8 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support and equipment support materials and installation requirements are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1-1/4 (DN 32) and Smaller: Maximum span, 84 inches (2130 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1-1/2 (DN 40): Maximum span, 108 inches (2740 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 2 (DN 50): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).
4. NPS 2-1/2 (DN 65): Maximum span, 11 feet (3.4 m); minimum rod size, 1/2 inch (13 mm).
5. NPS 3 (DN 80): Maximum span, 12 feet (3.7 m); minimum rod size, 1/2 inch (13 mm).
6. NPS 4 (DN 100): Maximum span, 13 feet (4 m); minimum rod size, 5/8 inch (16 mm).

C. Support vertical steel pipe at each floor and at spacing not greater than 15 feet (4.5 m).

3.9 FUEL MAINTENANCE SYSTEM INSTALLATION

A. Install suction line, with foot valve, at one end of storage tank, 1 inch (25 mm) from the bottom of tank.

B. Install return line at the opposite end of storage tank from suction line.

3.10 LIQUID-LEVEL GAGE SYSTEM INSTALLATION

A. Install liquid-level gage system. Locate panel inside building where indicated.

3.11 LEAK-DETECTION AND MONITORING SYSTEM INSTALLATION

A. Install leak-detection and monitoring system. Install alarm panel inside building where indicated.

1. Double-Wall, Fuel-Oil Storage Tanks: Install probes or use factory-installed integral probes in interstitial space.
2. Single-Wall, Fuel-Oil Storage Tanks: Install probes as indicated.
3. Double-Containment, Fuel-Oil Piping: Install leak-detection sensor probes in fuel-oil storage tank containment sumps and at low points in piping cable probes in interstitial space of double-containment piping.
4. Install liquid-level gage.

3.12 CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

B. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment having threaded pipe connection.

C. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

D. Connect piping to equipment with ball valve and union. Install union between valve and equipment.

E. Install flexible piping connectors at final connection to burners or oil-fired appliances that must be moved for maintenance access.

3.13 LABELING AND IDENTIFYING

A. Nameplates, pipe identification, and signs are specified in Section 230553 "Identification for HVAC Piping and Equipment."

B. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on or near each service regulator, service meter, and earthquake valve.

1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

3.14 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (457-mm) centers around the full perimeter of the base.

3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Use 3000-psig (20.7-MPa), 28-day, compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete."

3.15 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Tanks: Minimum hydrostatic or compressed-air test pressures for fuel-oil storage tanks that have not been factory tested and do not bear the ASME code stamp or a listing mark acceptable to authorities having jurisdiction:
   a. Double-Wall Tanks:
      1) Inner Tanks: Minimum 3 psig (20.7 kPa) and maximum 5 psig (34.5 kPa).
      2) Interstitial Space: Minimum 3 psig (20.7 kPa) and maximum 5 psig (34.5 kPa), or 5.3-in. Hg (18-kPa) vacuum.
   b. Where vertical height of fill and vent pipes is such that the static head imposed on the bottom of the tank is greater than 10 psig (69 kPa), hydrostatically test the tank and fill and vent pipes to a pressure equal to the static head thus imposed.
   c. Maintain the test pressure for one hour.
2. Piping: Minimum hydrostatic or pneumatic test-pressures measured at highest point in system:
   a. Fuel-Oil, Double-Containment Piping:
      1) Carrier Pipe: Minimum 5 psig (34.5 kPa) for minimum 30 minutes.
      2) Containment Conduit: Minimum 5 psig (34.5 kPa) for minimum 60 minutes.
   b. Suction Piping: Minimum 20-in. Hg (68 kPa) for minimum 30 minutes.
   c. Isolate storage tanks if test pressure in piping will cause pressure in storage tanks to exceed 10 psig (69 kPa).
3. Inspect and test fuel-oil piping according to NFPA 31, "Tests of Piping" Paragraph; and according to requirements of authorities having jurisdiction.
4. Test liquid-level gage for accuracy by manually measuring fuel-oil levels at not less than three different depths while filling tank and checking against gage indication.

5. Test leak-detection and monitoring system for accuracy by manually operating sensors and checking against alarm panel indication.
6. Start fuel-oil transfer pumps to verify for proper operation of pump and check for leaks.
7. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
8. Bleed air from fuel-oil piping using manual air vents.

D. Fuel-oil piping and equipment will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.16 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain liquid-level gage systems, leak-detection and monitoring systems fuel-oil pumps.

3.17 INDOOR PIPING SCHEDULE

A. Aboveground fuel-oil piping shall be one of the following:

1. NPS 1/2 (DN 15) and Smaller: Steel pipe, steel or malleable-iron threaded fittings, and threaded joints.
2. NPS 5/8 to NPS 2 (DN 18 to DN 50): Steel pipe, steel or malleable-iron threaded fittings, and threaded joints.
3. NPS 2-1/2 (DN 65) and Larger: Steel pipe, steel fittings, and welded or flanged joints.
4. Steel pipe with malleable-iron fittings and threaded joints.
5. Steel pipe with wrought-steel fittings and welded joints.

3.18 ABOVEGROUND MANUAL FUEL-OIL SHUTOFF VALVE SCHEDULE

A. Distribution piping valves for pipe NPS 2 (DN 50) and smaller shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

B. Distribution piping valves for pipe NPS 2-1/2 (DN 65) and larger shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

C. Valves in branch piping for single appliance shall be the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.

END OF SECTION

FACILITY NATURAL-GAS PIPING Section 23 11 23

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes fuel gas piping within the building. Products include the following:

1. Pipe, tube, fittings, and joining materials.
2. Protective pipe and fitting coating.
3. Piping specialties.
4. Specialty valves.
5. Service meters.
6. Pressure regulators.

B. Related Sections include the following:

1. Division 1 Section for LEED Requirements.
2. Division 2 Section for Natural Gas Distribution for natural gas service piping, specialties, and accessories outside the building.

1.3 PROJECT CONDITIONS

A. Gas System Pressures: Three pressure ranges. Primary pressure is more than 2.0 psig but not more than 50.0 psig, and is reduced to secondary pressures of more than 0.5 psig but not more than 10.0 psig, and is reduced again to pressures of 0.5 psig or less.

B. Design values of fuel gas supplied for these systems are as follows:

1. Nominal Heating Value: 1000 Btu/cu. ft.
2. Nominal Specific Gravity: 0.6.
3. Nominal Heating Value: 3200 Btu/cu. ft.
4. Nominal Specific Gravity: 2.11.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Corrugated, stainless-steel tubing systems. Include associated components.

2. Specialty valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
3. Service-meter bars. Include service-meter size of selected models.
4. Service meters. Include pressure rating and capacity of selected models.
5. Service-meter bypass fittings.
6. Pressure regulators. Include pressure rating, capacity, and settings of selected models.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings: For fuel gas piping. Include plans and attachments to other work.

D. Retain subparagraph below if equipment includes wiring.

1. Wiring Diagrams: Power, signal, and control wiring.

E. Welding certificates.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For natural gas specialties and accessories to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

B. Electrical Components and Devices: 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. NFPA Standard: Comply with NFPA 54, "National Fuel Gas Code."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify fuel gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.7 COORDINATION

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 CORRUGATED, STAINLESS-STEEL TUBING SYSTEMS

A. Description: Comply with AGA LC 1 and include the following:

1. Tubing: Corrugated stainless steel with plastic jacket or coating.
2. Fittings: Copper alloy with ends made to fit corrugated tubing. Include ends with threads according to ASME B1.20.1 if connection to threaded pipe or fittings is required.
3. Striker Plates: Steel, designed to protect tubing from penetrations.
4. Manifolds: Malleable iron or steel with protective coating. Include threaded connections according to ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
5. Manufacturers:

a. OmegaFlex, Inc.
b. Titeflex Corp.
c. Tru-Flex Metal Hose Corp.
d. Ward Industries, Inc.

2.4 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

A. Steel Pipe: ASTM A 53/A 53M; Type E or S; Grade B; black. Wall thickness of wrought-steel pipe shall comply with ASME B36.10M.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
2. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
3. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
4. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
5. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
6. Joint Compound and Tape: Suitable for natural gas.
7. Steel Flanges and Flanged Fittings: ASME B16.5.
8. Gasket Material: Thickness, material, and type suitable for natural gas.

2.5 PROTECTIVE COATING

A. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in contact with materials that may corrode the pipe.

2.6 PIPING SPECIALTIES

A. Flexible Connectors: ANSI Z21.24, copper alloy.

B. Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.

2.7 SPECIALTY VALVES

A. Valves, NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

B. Valves, NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

C. Appliance Connector Valves: ANSI Z21.15 and CSA International listed.

1. Manufacturers:

a. Brass Craft Manufacturing Co.
b. Mueller Co.; Mueller Gas Products Div.
c. Watts Industries, Inc.; Water Products Div.

D. Gas Valves, NPS 2 and Smaller: ASME B16.33 and CSA International-listed bronze body and 125-psig pressure rating.

1. Manufacturers:

a. Milwaukee Valve Company.
b. NIBCO INC.
c. Red-White Valve Corp.

2. Tamperproof Feature: Include design for locking.

E. Plug Valves, NPS 2-1/2 and Larger: ASME B16.38 and MSS SP-78 cast-iron, lubricated plug valves, with 125-psig pressure rating.

1. Manufacturers:

a. Flow Control Equipment, Inc.
b. Milliken Valve Co., Inc.
c. Nordstrom Valves, Inc.
d. Olson Technologies, Inc.; Homestead Valve Div.
e. Walworth Co.

2. Tamperproof Feature: Include design for locking.

2.8 SERVICE METERS (BY GAS UTILITY COMPANY)

2.9 PRESSURE REGULATORS

A. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.

1. Manufacturers:

a. Service Pressure Regulators:

1) American Meter Company.
2) Fisher Controls International, Inc.; Division of Emerson.
3) Invensys.
4) National Meter Industries, Inc.
5) Richards Industries, Inc.; Jordan Valve Div.
6) Schlumberger Limited; Gas Div.

b. Line Pressure Regulators:

1) American Meter Company.
2) Donkin, Bryan RMG Canada, Ltd.
3) Eclipse Combustion, Inc.
4) Fisher Controls International, Inc.; Division of Emerson.
5) Invensys.
6) Maxitrol Company.
7) National Meter Industries, Inc.
8) Richards Industries, Inc.; Jordan Valve Div.
9) Schlumberger Limited; Gas Div.

c. Appliance Pressure Regulators:

1) Canadian Meter Co., Inc.
2) Eaton Corporation; Controls Div.
3) Harper Wyman Co.
4) Maxitrol Company.
5) SCP, Inc.

2. NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
3. NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
4. Service Pressure Regulators: ANSI Z21.80. Include 100-psig- minimum inlet pressure rating.
5. Line Pressure Regulators: ANSI Z21.80 with 2-psig- minimum inlet pressure rating.
6. Line Pressure Regulators: ANSI Z21.80 with 10-psig inlet pressure rating, unless otherwise indicated.
7. Appliance Pressure Regulators: ANSI Z21.18. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

B. Pressure Regulator Vents: Factory- or field-installed, corrosion-resistant screen in opening if not connected to vent piping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for fuel oil piping system to verify actual locations of piping connections before equipment installation.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

3.3 SERVICE-METER ASSEMBLY INSTALLATION (BY GAS UTILITY COMPANY)

3.4 SERVICE ENTRANCE PIPING

A. Extend fuel gas piping and connect to fuel gas distribution for service entrance to building.

1. Exterior fuel gas distribution system piping, service pressure regulator, and service meter will be provided by gas utility.
2. Natural gas distribution system piping, service pressure regulator, and service meter.

B. Install dielectric fitting downstream from and adjacent to each service meter unless meter is supported from service-meter bar with integral dielectric fitting. Install shutoff valve downstream from and adjacent to dielectric fitting. Dielectric fittings are specified in Division 23 Sections for Basic Mechanical Materials and Methods.

C. Install strainer upstream from each earthquake valve. Strainers are specified in Division 22 Sections for Plumbing Specialties.

3.5 PIPING APPLICATIONS

A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.

B. Fuel Gas Piping, 2 psig or Less:

1. NPS 1/2 and Smaller: NPS 3/4 steel pipe, malleable-iron threaded fittings, and threaded joints.

a. Option: Soft copper tube, copper fittings, and brazed joints may be used for runouts at individual appliances.

2. NPS 3/4 and NPS 1: Steel pipe, malleable-iron threaded fittings, and threaded joints.

a. Option: Soft copper tube, copper fittings, and brazed joints may be used for runouts at individual appliances.

3. NPS 1-1/4 to NPS 2: Steel pipe, steel welding fittings, and welded joints.
4. NPS 2-1/2 to NPS 4 and Larger: Steel pipe, steel welding fittings, and welded joints.

C. Fuel Gas Piping 2 to 5 psig:

1. NPS 4 and Larger: Steel pipe, steel welding fittings, and welded joints.
2. Larger Than NPS 4: Steel pipe, steel welding fittings, and welded joints.

D. Underground Fuel Gas Piping: Steel pipe, steel welding fittings, and welded joints. Encase in containment conduit.

E. Containment Conduits: Steel pipe, steel welding fittings, and welded joints.

F. Gas Service Piping at Meters and Regulators, More Than 5 psig: Steel pipe, steel welding fittings, and welded joints.

3.6 VALVE APPLICATIONS

A. Appliance Shutoff Valves for Pressure 0.5 psig or Less: Appliance connector valve or gas stop.

B. Appliance Shutoff Valves for Pressure 0.5 to 2 psig: Gas stop or gas valve.

C. Appliance Shutoff Valves for Pressure 2 to 5 psig: Gas valve.

D. Piping Line Valves, NPS 2 and Smaller: Gas valve.

E. Piping Line Valves, NPS 2-1/2 and Larger: Plug valve or general-duty valve.

F. Valves at Service Meter, NPS 2 and Smaller: Gas valve.

G. Valves at Service Meter, NPS 2-1/2 and Larger: Plug valve.

3.7 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 23 Sections for Basic Mechanical Materials and Methods.

B. Concealed Locations: Except as specified below, install concealed gas piping in airtight conduit constructed of Schedule 40, seamless, black steel pipe with welded joints. Vent conduit to outside and terminate with screened vent cap.

1. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, whether or not such spaces are used as plenums. Do not locate valves above ceilings.
2. In Floors: Gas piping with welded joints and protective wrapping specified in Part 2 "Protective Coating" Article may be installed in floors, subject to approval of authorities having jurisdiction. Surround piping cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as

reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.

3. In Floor Channels: Gas piping may be installed in floor channels, subject to approval of authorities having jurisdiction. Channels must have cover and be open to space above cover for ventilation.
4. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls.

    a. Exception: Tubing passing through partitions or walls.

5. In Walls: Gas piping with welded joints and protective wrapping specified in Part 2 "Protective Coating" Article may be installed in masonry walls, subject to approval of authorities having jurisdiction.
6. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.

    a. Exception: Accessible above-ceiling space specified above.

C. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

D. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.

E. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.

F. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

G. Connect branch piping from top or side of horizontal piping.

H. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

I. Install corrugated, stainless-steel tubing system according to manufacturer's written instructions. Include striker plates to protect tubing from puncture where tubing is restrained and cannot move.

J. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.

K. Install pressure gage upstream and downstream from each line pressure regulator.

L. Install flanges on valves, specialties, and equipment having NPS 2-1/2 and larger connections.

M. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

N. Install containment conduits for gas piping below slabs, within building, in gastight conduits extending minimum of 4 inches outside building, and vented to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end. Prepare and paint outside of conduits with coal-tar, epoxy-polyamide paint according to SSPC-Paint 16.

3.8 JOINT CONSTRUCTION

A. Basic piping joint construction is specified in Division 23 Sections for Basic Mechanical Materials and Methods.

B. Use materials suitable for fuel gas.

1. Brazed Joints: Make with brazing alloy with melting point greater than 1000 deg F. Brazing alloys containing phosphorus are prohibited.

C. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.9 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support and equipment support materials and installation requirements are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equuipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

C. Install hangers for horizontal hard copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 1/2 and NPS 5/8: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and NPS 7/8: Maximum span, 84 inches; minimum rod size, 3/8 inch.
4. NPS 1: Maximum span, 96 inches; minimum rod size, 3/8 inch.

D. Install hangers for horizontal corrugated, stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8 and NPS 1/2: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 3/4 and NPS 1: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. Option: Support tubing from structure according to manufacturer's written instructions.

3.10 CONNECTIONS

A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

B. Install piping adjacent to appliances to allow service and maintenance.

C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

E. Ground equipment according to Division 26 Section for Grounding and Bonding.

1. Do not use gas pipe as grounding electrode.

F. Connect wiring according to Division 26 Section for Conductors and Cables.

3.11 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each service meter, pressure regulator, and specialty valve.

1. Text: In addition to name of identified unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
2. Nameplates, pipe identification, and signs are specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.12 PAINTING

A. Use materials and procedures in Section 09 91 00 Painting.

B. Paint exterior service meters, pressure regulators, and specialty valves.

1. Color: Gray.

3.13 FIELD QUALITY CONTROL

A. Test, inspect, and purge piping according to NFPA 54 and requirements of authorities having jurisdiction.

B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

C. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

D. Verify correct pressure settings for pressure regulators.

E. Verify that specified piping tests are complete.

END OF SECTION

FACILITY ABOVEGROUND FUEL-OIL STORAGE TANKS — Section 23 13 23

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete-vaulted, steel, fuel-oil ASTs.

1.3 DEFINITIONS

A. AST: Aboveground storage tank.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and dimensions of individual components and profiles.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
3. Fuel-oil storage tank accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and ballast pads and anchors, and lifting or supporting points.
2. Indicate dimensions, components, and location and size of each field connection.
3. Shop Drawing Scale: 1/4 inch per foot (1:50).

1.5 INFORMATIONAL SUBMITTALS

A. Site Survey: Plans, drawn to scale, on which fuel-oil storage tanks are shown and coordinated with other services and utilities.

B. Qualification Data: For qualified professional engineer.

C. Seismic Qualification Certificates: For ASTs, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Brazing certificates.

E. Welding certificates.

F. Field quality-control reports.

G. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuel-oil equipment and accessories to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. EPA Compliance: Comply with EPA and state and local authorities having jurisdiction. Include recording of fuel-oil storage tanks and monitoring of tanks.

B. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of fuel-oil storage tanks that fail in materials or workmanship within specified warranty period.

1. Storage Tanks:

a. Failures include, but are not limited to, the following when used for storage of fuel oil at temperatures not exceeding 150 deg F (66 deg C):

1) Structural failures including cracking, breakup, and collapse.
2) Corrosion failure including external and internal corrosion of steel tanks.

b. Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design restraint and anchors for fuel-oil ASTs, and equipment,

including comprehensive engineering analysis, using performance requirements and design criteria indicated.

B. Seismic Performance: Factory-installed support attachments for AST 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 when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 CONCRETE-VAULTED, STEEL, FUEL-OIL AST

A. Description: UL 142 and UL 2085; thermally insulated, fire-resistant and protected, double-wall, horizontal, steel tank; with primary- and secondary-containment walls and insulation and with interstitial space.

B. Construction: Fabricated with welded, carbon steel and insulation and encased in concrete that will protect from bullets; suitable for operation at atmospheric pressure and for storing fuel oil with specific gravity up to 1.1 and with test temperature according to UL 2085.

C. Capacities and Characteristics:

1. Capacity: 1000 gal. (L).
2. Connection Sizes:

a. Fill Line: 2" NPS (DN).
b. Vent Line: 2" NPS (DN).
c. Outlet: 3/4" NPS (DN).
d. Gage: 2" NPS (DN).

3. Fuel-Oil Grade Number: Diesel.

2.3 SHOP PAINTING OF AST

A. Apply manufacturer's standard prime coat to exterior steel surface of AST and supports.

B. Prepare exterior steel surface of AST and tank supports.

C. Shop Cleaning: After fabrication, blast clean according to SSPC-SP 6/NACE No. 3.

D. After cleaning, remove dust or residue from cleaned surfaces.

E. If surface develops rust before prime coat is applied, repeat surface preparation.

F. Apply manufacturer's standard prime coat to shop-cleaned, dry surface same day as surface preparation.

G. Apply manufacturer's standard two-component, epoxy finish coats.

2.4 FUEL-OIL AST ACCESSORIES

A. Tank Manholes: 22-inch- (560-mm-) minimum diameter; bolted, flanged, and gasketed; centered on top of tank.

B. Threaded pipe connection fittings on top of tank, for fill, supply, return, vent, sounding, and gaging. Include cast-iron plugs for shipping.

C. Striker Plates: Inside tank, on bottom below fill, vent, sounding, gage, and other tube openings.

D. Lifting Lugs: For handling and installation.

E. Supply Tube: Extension of supply piping fitting into tank, terminating 6 inches (150 mm) above tank bottom and cut at a 45-degree angle (1:1 slope).

F. Sounding and Gage Tubes: Extension of fitting into tank, terminating 6 inches (150 mm) above tank bottom and cut at a 45-degree angle (1:1 slope).

2.5 LEAK-DETECTION AND MONITORING SYSTEM

A. Cable and Sensor System: Comply with UL 1238.

1. Calibrated leak-detection and monitoring system with probes and other sensors and remote alarm panel for fuel-oil storage tanks and fuel-oil piping.
2. Include fittings and devices required for testing.
3. Controls: Electrical, operating on 120-V ac.
4. Calibrated liquid-level gage complying with UL 180 with floats or other sensors and remote annunciator panel.
5. Remote Annunciator Panel: With visual and audible, high-tank-level and low-tank-level alarms; fuel indicator with registration in gallons ((liters);) and overfill alarm. Include gage volume range that covers fuel-oil storage capacity.
6. Controls: Electrical, operating on 120-V ac.

2.6 FUEL OIL

A. Diesel Fuel Oil: ASTM D 975, Grade No. 2-D, general purpose, high volatility.

2.7 SOURCE QUALITY CONTROL

A. Pressure test and inspect fuel-oil storage tanks, after fabrication and before shipment, according to ASME and the following:

1. Horizontal, Concrete-Vaulted and Insulated, Steel ASTs: UL 142 and UL 2085.

B. Affix standards organization's code stamp.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for aboveground fuel-oil storage tanks to verify actual locations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUEL-OIL AST INSTALLATION

A. Install tank bases and supports.

B. Concrete Bases: Anchor AST to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (457-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Use 3000-psig (20.7-MPa), 28-day, compressive-strength concrete and reinforcement as specified Section 033053 "Miscellaneous Cast-in-Place Concrete."

C. Connect piping and vent fittings.

D. Install ground connections.

E. Install tank leak-detection and monitoring devices.

F. Install insulated and concrete-vaulted, steel ASTs according to STI R942.

G. Fill storage tanks with fuel oil.

3.3 LABELING AND IDENTIFYING

A. Nameplates, pipe identification, and signs are specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.4 FIELD PAINTING OF AST

A. Prepare and touch up damaged exterior surface of AST and supports

B.] as specified in "Shop Painting of AST" Article.

C. Prepare exterior steel surface of AST and tank supports.

D. Field Cleaning: After fabrication, blast clean according to SSPC-SP 6/NACE No. 3.

E. After cleaning, remove dust or residue from cleaned surfaces.

F. If surfaces develop rust before prime coat is applied, repeat surface preparation.

G. Prepare surface of AST and supports and apply painting systems according to specifications in Section 099600 "High-Performance Coatings" for moderate environment semigloss finish for ferrous metal.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Tanks: Minimum hydrostatic or compressed-air test pressures for fuel-oil storage tanks that have not been factory tested and do not bear the ASME code stamp or a listing mark acceptable to authorities having jurisdiction:

a. Double-Wall Tanks:

1) Inner Tanks: Minimum 3 psig (20.7 kPa) and maximum 5 psig (34.5 kPa).
2) Interstitial Space: Minimum 3 psig (20.7 kPa) and maximum 5 psig (34.5 kPa), or 5.3-in. Hg (18-kPa) vacuum.

b. Where vertical height of fill and vent pipes is such that the static head imposed on the bottom of the tank is greater than 10 psig (69 kPa), hydrostatically test the tank and fill and vent pipes to a pressure equal to the static head thus imposed.
c. Maintain the test pressure for one hour.

C. ASTs will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

REFRIGERANT PIPING Section 23 23 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated.

B. Shop Drawings: 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. Show interface and spatial relationships between piping and equipment.

1. Shop Drawing Scale: 1/4 inch equals 1 foot (1:50).
2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual 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.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to 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."

1.8 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.9 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B).

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.

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 (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 275 deg F (135 deg C).

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig (3450 kPa).
8. Maximum Operating Temperature: 275 deg F (135 deg C).

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig (3.4 kPa).
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 275 deg F (135 deg C).

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig (3450 kPa).

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and [24] [115] [208]-V ac coil.
6. Working Pressure Rating: 400 psig (2760 kPa).
7. Maximum Operating Temperature: 240 deg F (116 deg C).

8. Manual operator.

F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig (2760 kPa).
6. Maximum Operating Temperature: 240 deg F (116 deg C).

G. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: [40 deg F (4.4 deg C)].
6. Superheat: Adjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.

H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
5. Seat: Polytetrafluoroethylene.
6. Equalizer: Internal
7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and 24-V ac coil.
8. End Connections: Socket.
9. Throttling Range: Maximum 5 psig (34 kPa).
10. Working Pressure Rating: 500 psig (3450 kPa).
11. Maximum Operating Temperature: 240 deg F (116 deg C).

I. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig (3450 kPa).
5. Maximum Operating Temperature: 275 deg F (135 deg C).

J. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig (3450 kPa).
6. Maximum Operating Temperature: 275 deg F (135 deg C).

K. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 240 deg F (116 deg C).

L. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: [2 psig (14 kPa)].
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 240 deg F (116 deg C).

M. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated [alumina] [charcoal].
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: [2 psig (14 kPa)] <Insert value>.
8. Rated Flow: <Insert tons (kW).>
9. Working Pressure Rating: 500 psig (3450 kPa).
10. Maximum Operating Temperature: 240 deg F (116 deg C).

N. Mufflers:

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or flare.
3. Working Pressure Rating: 500 psig (3450 kPa).
4. Maximum Operating Temperature: 275 deg F (135 deg C).

O. Receivers: Comply with ARI 495.

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig (3450 kPa).

7. Maximum Operating Temperature: 275 deg F (135 deg C).

P. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig (3450 kPa).
4. Maximum Operating Temperature: 275 deg F (135 deg C).

2.3 REFRIGERANTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 (DN 40) and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR or L (B), annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

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 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. Refer to Section 230900 "HVAC Instrumentation and Controls" and Section 230993 "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. 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 083113 "Access Doors and Panels" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. 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.

P. 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.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "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 230517 "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 230518 "Escutcheons for HVAC Piping."

3.3 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. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. 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.

F. 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 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.

G. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.

H. Welded Joints: Construct joints according to AWS D10.12/D10.12M.

I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6 m) or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) 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 sizes:

1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
4. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
5. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).

D. Support multifloor vertical runs at least at each floor.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. 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 Part 1 "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.

3.6 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 (67 Pa). 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 (14 kPa).
4. Charge system with a new filter-dryer core in charging line.

3.7 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

METAL DUCTS Section 23 31 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch wg.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Related Sections include the following:

1. Division 1 Section "LEED Requirements".
2. Division 7 Sections 07 92 10 "Joint Sealants" and 07 84 00 "Firestopping" for fire-resistant sealants for use around duct penetrations and fire-damper installations in fire-rated floors, partitions, and walls.
3. Division 23 Section 23 07 13 "Duct Insulation" for duct insulation.
4. Division 23 Section 23 33 00 "Air Duct Accessories" for dampers, sound-control devices, duct-mounted access doors and panels, turning vanes, and flexible ducts.
5. Division 23 Section 23 37 13 "Diffusers, Registers, and Grilles."
6. Division 23 Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for air balancing and final adjusting of manual-volume dampers.

1.3 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula Btu x in./h x sq. ft. x deg F or W/m x K at the temperature differences specified. Values are expressed as Btu or W.

1. Example: Apparent Thermal Conductivity (k-Value): 0.26 or 0.037.

1.4 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

1.5 SUBMITTALS

A. Product Data: For duct liner and sealing materials.

B. Shop Drawings: Show details of the following:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Duct layout indicating pressure classifications and sizes on plans.
3. Fittings.
4. Reinforcement and spacing.
5. Seam and joint construction.
6. Penetrations through fire-rated and other partitions.
7. Terminal unit, and coil, installations.
8. Hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and duct attachment.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension assembly members.
2. Other systems installed in same space as ducts.
3. Ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
4. Coordination with ceiling-mounted items, including lighting fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.

D. Welding Certificates: Copies of certificates indicating welding procedures and personnel comply with requirements in "Quality Assurance" Article.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.6 QUALITY ASSURANCE

A. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.

C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.

C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards—Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 DUCT LINER

A. General: Comply with NFPA 90A or NFPA 90B and NAIMA's "Fibrous Glass Duct Liner Standard."

1. Manufacturers:

a. CertainTeed Corp.; Insulation Group.
b. Johns Manville International, Inc.
c. Knauf Fiber Glass GmbH.

B. Materials: ASTM C 1071 with coated surface exposed to airstream to prevent erosion of glass fibers.

1. Thickness: 1 inch (inside).
2. Thickness: 1-1/2 inches (outdoors).
3. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
4. Fire-Hazard Classification: Maximum flame-spread rating of 25 and smoke-developed rating of 50, when tested according to ASTM C 411.
5. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and ASTM C 916.
6. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.

a. Tensile Strength: Indefinitely sustain a 50-lb- tensile, dead-load test perpendicular to duct wall.
b. Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.
c. Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

2.4 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

1. Joint and Seam Tape: 2 inches wide; glass-fiber fabric reinforced.
2. Tape Sealing System: Woven-fiber tape impregnated with a gypsum mineral compound and a modified acrylic/silicone activator to react exothermically with tape to form a hard, durable, airtight seal.
3. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.
4. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.5 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for building materials.

1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

B. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.
2. Straps and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
3. Supports for Aluminum Ducts: Aluminum support materials, unless materials are electrolytically separated from ductwork.

2.6 RECTANGULAR DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness reinforcement size and spacing and joint reinforcement.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Nexus, Inc.
c. Ward Industries, Inc.

C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards—Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Lockformer.

D. Duct Size: Maximum 30-inches wide and up to 2-inch wg pressure class.

E. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

F. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.

2.7 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness are prohibited.

B. Apply adhesive to liner facing in direction of airflow not receiving metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liners in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profile or are integrally formed from duct wall. Fabricate edge facings at the following locations:

1. Fan discharge.
2. Intervals of lined duct preceding unlined duct.
3. Upstream edges of transverse joints in ducts.

I. Secure insulation liner with perforated sheet metal liner of same metal thickness as specified for duct, secured to ducts with mechanical fasteners that maintain metal liner distance from duct without compressing insulation.

1. Sheet Metal Liner Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

J. Terminate liner with duct buildouts installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire-damper sleeve.

2.8 ROUND AND FLAT-OVAL DUCT FABRICATION

A. General: Diameter as applied to flat-oval ducts in this Article is the diameter of the size of round duct that has a circumference equal to perimeter of a given size of flat-oval duct.

B. Round Longitudinal- and Spiral Lock Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

C. Flat-Oval, Longitudinal- and Spiral Lock Seam Ducts: Fabricate supply ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Fabricate ducts larger than 72-inches in diameter with butt-welded longitudinal seams.

1. Manufacturers:

a. McGill AirFlow Corporation.
b. SEMCO Incorporated.

2.9 ROUND AND FLAT-OVAL DUCT FITTING FABRICATION

A. Ducts up to 20-inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.

B. Ducts 21 to 72-inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.

C. Ducts Larger than 72-inches in Diameter: Companion angle flanges joints per SMACNA "HVAC Duct Construction Standards—Metal and Flexible," Figure 3-2.

D. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.

1. Manufacturers:

a. Lindab Inc.

E. Flat-Oval Ducts: Prefabricated connection system consisting of two flanges and one synthetic rubber gasket.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. McGill AirFlow Corporation.
c. SEMCO Incorporated.

F. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal seam straight duct.

G. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from body onto branch tap entrance.

H. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate bend radius of die-formed, gored, and pleated elbows one and one-half times elbow diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg:

    a. Ducts 3 to 26 Inches in Diameter: 0.028 inch.
    b. Ducts 27 to 36 Inches in Diameter: 0.034 inch.
    c. Ducts 37 to 50 Inches in Diameter: 0.040 inch.
    d. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
    e. Ducts 62 to 84 Inches in Diameter: 0.064 inch.

3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:

    a. Ducts 3 to 14 Inches in Diameter: 0.028 inch.
    b. Ducts 15 to 26 Inches in Diameter: 0.034 inch.
    c. Ducts 27 to 50 Inches in Diameter: 0.040 inch.
    d. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
    e. Ducts 62 to 84 Inches in Diameter: 0.064 inch.

4. Flat-Oval Mitered Elbows: Welded construction with same metal thickness as longitudinal seam flat-oval duct.
5. 90-Degree, Two-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material-handling classes A and B; and only where space restrictions do not permit using 1.5 bend radius elbows. Fabricate with single-thickness turning vanes.
6. Round Elbows, 8 Inches and Smaller: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.
7. Round Elbows, 9 through 14 Inches: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees, unless space restrictions require a mitered elbow. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.
8. Round Elbows, Larger Than 14 Inches, and All Flat-Oval Elbows: Fabricate gored elbows, unless space restrictions require a mitered elbow.
9. Die-Formed Elbows for Sizes through 8 Inches and All Pressures: 0.040 inch thick with two-piece welded construction.
10. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
11. Flat-Oval Elbow Metal Thickness: Same as longitudinal seam flat-oval duct specified above.
12. Pleated Elbows for Sizes through 14 Inches and Pressures through 10-Inch wg: 0.022 inch.

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:

1. Supply Ducts (before Air Terminal Units): 4-inch wg.
2. Supply Ducts (after Air Terminal Units): 2-inch wg.
3. Return Ducts (Negative Pressure): 2-inch wg.
4. Exhaust Ducts (Negative Pressure): 2-inch wg.

B. All ducts shall be galvanized steel.

3.2 DUCT INSTALLATION

A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards—Metal and Flexible," unless otherwise indicated.

B. Install round and flat-oval ducts in lengths not less than 12 feet, unless interrupted by fittings.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, changes in size and shape, and connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct.

F. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.

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. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

L. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.

M. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke

dampers are specified in Division 23 Section "Air Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Firestopping."

N. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Refer to SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

O. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction".

P. Paint interiors of metal ducts, that do not have duct liner, for 24-inches upstream of registers and grilles. Apply one coat of flat black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified Division 9 painting Sections.

3.3 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Pressure Classification Less Than 2-Inch wg: Transverse joints.

C. Seal externally insulated ducts before insulation installation.

3.4 HANGING AND SUPPORTING

A. Install rigid round, rectangular, and flat-oval metal duct with support systems indicated in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

E. Install concrete inserts before placing concrete.

F. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3.5 CONNECTIONS

A. Connect equipment with flexible connectors according to Division 23 Section "Air Duct Accessories."

B. For branch, outlet and inlet, and terminal unit connections, comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

3.6 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.

B. Conduct tests, in presence of Engineer, at static pressures equal to maximum design pressure of system or section being tested. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

C. Determine leakage from entire system or section of system by relating leakage to surface area of test section.

1. Allowable Leakage, Supply Duct System: 2 percent of design airflow.
2. Allowable Leakage, Exhaust Duct System: 2 percent of design airflow.
3. Allowable Leakage, Supply Duct Systems, Terminal to Air Outlets: 2 percent of design airflow.

D. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round and flat-oval ducts, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg.

E. Remake leaking joints and retest until leakage is less than maximum allowable.

F. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."

3.7 ADJUSTING

A. Adjust volume-control dampers in ducts, outlets, and inlets to achieve design airflow.

B. Refer to Division 23 Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for detailed procedures.

3.8 CLEANING

A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.

B. Use service openings, as required, for physical and mechanical entry and for inspection.

1. Create other openings to comply with duct standards.
2. Disconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling sections to gain access during the cleaning process.

C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.

D. Clean the following metal duct systems by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

F. Cleanliness Verification:

1. Visually inspect metal ducts for contaminants.
2. Where contaminants are discovered, re-clean and reinspect ducts.

END OF SECTION

AIR DUCT ACCESSORIES Section 23 33 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Turning vanes.
4. Duct-mounted access doors and panels.
5. Flexible ducts.
6. Flexible connectors.
7. Duct accessory hardware.

B. Related Sections include the following:

1. Division 1 Section for LEED Requirements.
2. Division 8 Section 08 31 00 "Access Doors and Panels" for wall- and ceiling-mounted access doors and panels.
3. Division Section 23 37 13 "Diffusers, Registers, and Grilles."
4. Division 23 Section 23 09 00 "Instrumentation and Controls for HVAC" for electric and pneumatic damper actuators.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Duct-mounted access doors and panels.
4. Flexible ducts.
5. Turning vanes.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:

1. Special fittings and manual- and automatic-volume-damper installations.

D. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Extruded Aluminum: ASTM B 221, Alloy 6063, Temper T6.

C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installations.

B. Frame: 0.052-inch- thick, galvanized, sheet steel, with welded corners and mounting flange.

C. Blades: 0.050-inch- thick aluminum sheet.

D. Blade Seals: Neoprene.

E. Blade Axles: Galvanized steel.

F. Tie Bars and Brackets: Galvanized steel.

G. Return Spring: Adjustable tension.

2.3 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classifications of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

B. Low-Leakage Volume Dampers: Multiple- or single-blade, opposed-blade design as indicated, low-leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized, sheet steel.
3. Blade Seals: Neoprene.
4. Blade Axles: Galvanized steel.
5. Tie Bars and Brackets: Galvanized steel.

C. Jackshaft: 1-inch- diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.

D. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch- wide, curved blades set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into side strips suitable for mounting in ducts.

C. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.5 DUCT-MOUNTED ACCESS DOORS AND PANELS

A. General: Fabricate doors and panels airtight and suitable for duct pressure class.

B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.6 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized, sheet.

C. Transverse Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 4-3/8-inch- wide, 0.028-inch- thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.

D. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp, and 360 lbf/inch in the filling.

E. Conventional, Outdoor System Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 530 lbf/inch in the warp, and 440 lbf/inch in the filling.

F. High-Corrosive-Environment System Flexible Connectors: Glass fabric coated with a chemical-resistant coating.

1. Minimum Weight: 14 oz./sq. yd..
2. Tensile Strength: 450 lbf/inch in the warp, and 340 lbf/inch in the filling.

2.7 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- thick, glass-fiber insulation around a continuous inner liner.

1. Reinforcement: Steel-wire helix encapsulated in inner liner.
2. Outer Jacket: Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
3. Inner Liner: Polyethylene film.

C. Pressure Rating: 6-inch wg positive, 1/2-inch wg negative.

2.8 ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch, zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.

B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.

C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

D. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.

1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
2. Install access panels on side of duct where adequate clearance is available.

E. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment."

F. Install turning vanes in 90° rectangular elbows.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Final positioning of manual-volume dampers is specified in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

END OF SECTION

CENTRIFUGAL HVAC FANS Section 23 34 16

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. In-line centrifugal fans.
2. Kitchen hood.

B. Related Sections include the following:

1. Division 1 Section "LEED Requirements".
2. Division 1 Section 01 91 00 "General Commissioning Requirements"
3. Division 23 Section 23 09 80 "Mechanical Commissioning"

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Fan speed controllers.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.
2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
3. 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.

D. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

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. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 IN-LINE CENTRIFUGAL FANS

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 the product indicated on Drawings or a comparable product by one of the following:

1. Greenheck.
2. Loren Cook Company.
3. Penn Ventilation.

C. Description: In-line, direct or belt-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

D. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

E. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

F. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

G. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

H. Accessories:

1. Variable-Speed Controller with all direct drive fans: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Backdraft Dampers: Gravity actuated with counterweight and interlocking aluminum blades with felt edges in steel frame installed on fan discharge.
3. Companion Flanges: For inlet and outlet duct connections.

4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.2 KITCHEN HOOD

A. Manufacturers: Subject to compliance with, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with, provide products the product indicated on the Drawings or a comparable product by one of the following:

1. Bluestar Pro-Line

C. Description: Commercial grade 18 gauge 300 stainless steel construction, welded seamless construction, dishwasher safe stainless steel baffle filters, variable blower control, halogen lamps with dimmer control, reversible top exhaust, color (per architect).

D. Accessories:

1. Internal blower kit
2. Discharge duct transition

2.3 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

B. Enclosure Type: Totally enclosed, fan cooled.

2.4 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Install units with clearances for service and maintenance.

C. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section 23 33 00"Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26.

D. Connect wiring according to Division 26.

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

VEHICLE EXHAUST REMOVAL SYSTEM Section 23 34 16.10

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

General Procurement conditions apply to this contract.

1.2 SUMMARY

A. Provide all labor, materials, and equipment necessary to put in working operation a complete turnkey system to remove both diesel and automotive exhaust gases and particulate of operating vehicles within the confines of specified fire station(s). All necessary controls, motors, fittings, ductwork, blower(s), labor and all other equipment and materials specified shall be part of the work.

C. All items of equipment and materials described in these specifications are to be furnished installed and placed into proper operating condition in accordance with good practice and manufacturer's written or published instructions.

1. The exhaust removal system shall provide 100 percent complete evacuation of all diesel fumes at the source from start up to exit of the apparatus from the fire station. The diesel exhaust removal system shall be capable of delivering complete coverage for bays up to 110 feet in length. The system must be able to accommodate drive through and back-in bays to meet all the needs of the fire department.
2. The system shall not affect personnel boarding the apparatus. Hose loops shall not hang any lower then six feet from the bay floor. The hose assembly shall not come into contact with the vehicle other than one connection point to the vehicles tailpipe. The hose assembly shall not touch or drag on the bay floor.
3. The exhaust system shall not block doorways, exits, and aisles in the apparatus bay, which could endanger the welfare of fire personnel or visitors.
4. To protect the apparatus electrical system from possible damage, the system bid shall not incorporate any type of electromagnetic device that requires the apparatus to be utilized as an electrical ground for systems operation.
5. The system must be designed and capable of capturing 100% of the exhaust gas and particulate even in the event of a complete power failure. The system shall not detach itself from the apparatus for any reason during a power failure other then normal exiting of the apparatus bay. System shall discharge exhaust outside the station even in the event of a power failure.
6. The system shall under no circumstance allow exhaust leakage or bypass the nozzle.

1.3 SUBMITTALS

A. Product Data: Indicate manufacturer's model number, technical data including description of components and static pressure/air flow chart, and installation instructions. Details of wiring for power differentiating between manufacturer-installed and field-installed wiring.

B. Closeout Submittals: Operation and Maintenance data manual including spare parts list.

1.4 QUALITY ASSURANCE

A. Engage a factory certified experienced installer to perform work of this Section who has completed installations similar in design and extent to that indicated for this Project, and who has a record of successful in-service performance.

B. All components shall be fabricated in strict accord with standards set forth in the current edition of ISO 9002. The manufacturer must be ISO 9001 Certified, UL and CUL Certified www.ul.com/database/ and certified by the Air Movement and Control Association (AMCA) www.amca.org/search.htm to ensure quality, consistency and reliability of products. Certification documents shall be provided and attached to the bid proposal. No exceptions.

C. Engage a firm experienced in manufacturing similar to that indicated for this Project and with a record of successful in-service performance.

D. Conduct conference at Project site. Review methods and procedures related to vehicle exhaust system installation.

1. Review access requirements for equipment delivery.
2. Review equipment storage and security requirements.
3. Inspect condition of preparatory work performed by other trades.
4. Review structural loading limitations.
5. Review that all components specified in this Section and related components specified in other Sections are accounted for.

1.5 DELIVERY, STORAGE AND HANDLING

Packing, Shipping, Handling and Unloading: Deliver hoses with protective packaging. Store in original protective crating and covering and in a dry location.

1.6 PROJECT/SITE CONDITIONS

Existing Conditions: Verify dimensions installation areas by field measurements.

1.7 COORDINATION

A. Coordinate layout and installation with other work, including light fixtures, fixed equipment and work stations, HVAC equipment, and fire-suppression system components.
B. Coordinate location and requirements of service-utility connections.

1.8 REFERENCES

A. Air Movement & Control Association International, Inc.
AMCA Standard 500-D-98, "Laboratory Methods of Testing Dampers for Rating".
B. ASTM International.

1. Stainless Steel:

a. A240/A240M-04ae1 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
b. Bright, Directional Polish: No. 4 finish.

2. Aluminum:

a. B209/209M-04 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
b. Powder-Coated Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

3. Galvanized Steel:

a. A653/A653M-04a Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

PART 2 - PRODUCTS

2.1 MANUFACTURER

PlymoVent Corporation/Plymovent Industrial Ventilation Systems
115 Melrich Rd., Suite 2
ECranbury, New Jersey 08512
USA
Telephone: (732) 417 0808
Toll Free: (800) 644-0911
FAX: (732) 417-1818
WEB: info@plymoventusa.com

MAIN FIRE STATION NO. 5 SYSTEM:

One STR 55 STRAIGHT RAIL SYSTEM 55 DRIVE THROUGH SINGLE VEHICLE SYSTEM WITH AUTOMATIC CRAB RETURN SYSTEM

One VSRA-30 VERTICAL STACK RAIL SINGLE VEHICLE BACKIN SYSTEM
One SBTA-21B SLIDING BALANCER TRACK (SINGLE TRACK, ONE VEHICLE) BACK-IN SYSTEM
One PLYMOVENT TEV 559-60 5 HP BLOWER AND
One OS-3 CONTROL PANEL WITH WIRELESS RECEIVER AND 2 TRANSMITTERS

TEMPORARY FIRE STATION NO. 5:
Two SBTA-21B SLIDING BALANCER TRACK (SINGLE TRACK, ONE VEHICLE) BACK-IN SYSTEM
One PLYMOVENT 'TEV-359 536 2 HP BLOWER AND
ONE OS-3 CONTROL PANEL WITH WIRELESS RECEIVER AND 2 TRANSMITTERS

ALTERNATE MANUFACTURERS: Manufacturer listed above is for purposes of description of the equipment required. This does not preclude other manufacturers who may meet this performance specification from bidding.

2.2 STR RAIL MATERIAL

Rail Material: One-piece continuous extruded aluminum rail in a minimum length of 19 feet (5791.2 mm) in an effort to reduce the points of leakage due to seams or connections. The construction profile shall be of a round profile type, diameter of 6.5 inches (165.1 mm) with a rail thickness of 0.175 inch (4.5 mm). The bottom portion of the rail shall have a continuous slot to accept a rubber seal. Rail Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M). Aluminum Rail: Extruded as a one piece design unit to maximize the structural integrity of the rail and to minimize joints. Extruded into the rail profile shall be all necessary mounting guides, which will allow for support of the rail mounting hardware and airline support cable. Mounting Channels: Provided continuously along both sides of the rail extrusion in order the proper positioning of all required mounting supports in accordance with codes. The rail shall allow the trolley/hose assembly to glide to the door threshold in a safe and effective manner. The extruded rail channel shall allow the whole rail to remain rigid and shall provide an area to attach bolts for splicing additional rails together for systems over 19 feet (5791.2 mm) long. The overall extruded rail lengths shall be 19 foot (5791.2 mm) standard. Rail System: Equipped with a hydraulic braking system that limits travel of flex hose as the vehicle exits the building. Hydraulic Brake: Incorporated into the end cap of the suction rail.

2.3 TOP MOUNTING SUSPENSION

Top Mounting Suspension: Designed to attach with 2 mounting cleats to the mounting slots that were extruded into the rail profile. The top suspension mount support shall be zinc plated bright finish and provided with 2 mounting cleats with four 5/16 inch (7.9 mm) by ¾ inch (19 mm) hex head bolts to attach the mounting support to the rail.

2.4 SUPPORT LEGS

Support Legs: Manufactured and provided by the supplier of primary exhaust removal system (Equipment Manufacturer). Support Leg Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M). Supports: Standard in 19 feet lengths. A minimum of one support with appropriate bracing shall be provided for every 10 lineal feet(3 m) to 12 linear feet (3.7 m) of rail profile. The support legs shall consist of a square outer profile with dimensions no less than 2 inch (50.8 mm) OD by 0.1 inch (2.54 mm) by with 0.4 inch (10 mm) fastening hardware provided. The vertical adjustable mounting foot shall be capable of attaching the leg assembly to a ceiling with a 30 degree pitch, complete with 3/8 inch (9.5 mm) hardware necessary for mounting the leg assembly to the top suspension mount. The support leg shall be equipped with round tubular zinc-plated steel knee brace with pressed ends in standard lengths of 20 inch (508 mm), 30 inch (762 mm) and 72 inch (1828.8 mm). The angle shall be completely adjustable to the leg support and mounted perpendicular and parallel to direction of the rail. The typical support angle shall be 45 degrees from the centerline of the factory provided support leg. The standard leg shall be capable of meeting a Seismic Zone 4 requirement. Vertical support and bracing shall be provided to safely secure the rail profile in accordance with building code and seismic standards which may apply. A minimum of one support with appropriate bracing shall be provided for every 10 lineal feet (3 m) to 12 linear feet (3.7 m)of rail profile.

2.5 HYDRAULIC BRAKE SYSTEM

Hydraulic Brake System: Incorporated into the end cap of the suction rail profile. The hydraulic brake system must incorporate a hydraulic shock capable of reducing the forward impact of 1 to 4 suction trolleys which may be installed now or in the future to the exhaust rail system. This hydraulic shock shall be secured to a steel end cap fabricated of 6.25 inch (158.8 mm) diameter steel tubing with a wall thickness of 0.156 inch (4 mm) welded to a 0.156 inch (4 mm) steel plate with formed 90 degree side rails for rigidity. The end cap shall have a removable circular end plate to facilitate an end feed duct connection and shall be a black powder coated finish. The hydraulic shock shall be capable of reducing to a full stop the trolleys in less than 4 inch (101.6 mm), without physical damage to either the rail profile or trolley that it is stopping.

2.6 RAIL SPLICING JOINT

Rail Splicing Joint: The splice joint shall be formed aluminum extrusion equal to the internal diameter of the suction rail profile. The splice shall have a wall thickness of no less than .190 inches (4.8 m) in thickness and a length of no less than 8 inches (203.2 mm) from end to end. The rail splicing shall be safely secured by no less than 12- 3/8 inch 314.3 mm) by 1-½ inch (38.1 mm) bolts, nuts and lock washers. Each bolt shall pass through the exterior of the rail profile and splicing joint and be secured on the inside by a lock washer and nut. Self tapping bolts or screws are not acceptable.

2.7 MIDDLE RAIL DUCT CONNECTION

Middle Rail Duct Connection: The rail duct connection shall be rectangular to an 8 inch diameter round transition fitting fabricated from 24 gauge galvanized steel (ASTM A653) with a double rubber U style lip seal. The rectangular slot shall be 19 inch (482.6 mm) long by 1-¾ inch (44.5 mm) high with a 3/8 inch (9.5 mm) external flange to slide into the rail profile.

2.8 TROLLEY ASSEMBLY

Trolley Assembly: Gantry type trolley with sealed bearing loaded wheels designed to roll inside the internal rail profile flange. The trolley chassis shall be galvanized steel (ASTM A653) epoxy coated with a black finish. The chassis shall be fitted with a tapered cone. Rubber Sealing Lips: Vulcanized Teflon strip covering 1-½ inch (38.1 mm) of the bottom edge of the sealing lip which shall minimize resistance between the cone and the rubber sealing lips. The exhaust cone transition shall be a tapered slot design which shall fit inside the suction rail profile. The tapered slot shall be equal or exceed in area the diameter of exhaust ventilation hose to which it is attached. Trolley Assembly: Equipped with rubber impact bumpers at both the front and rear of the trolley chassis to eliminate metal to metal contact which could damage the trolley assembly. There shall be a system balancer assembly provided to aid in the delivery of the hose to the exit door. Balancer Assembly: Self-adjusting weight spring tension balancer with a lifting capacity of no less than 31 pounds (31 KG). The balancer shall have a minimum diameter steel cable of .080 inch (2 mm) and have a safety link connection.

2.9 REGULATOR ASSEMBLY

Regulator Assembly: Constructed of cast aluminum. The regulator shall safely operate with an input pressure of 0 psi (0 KG/m^2) to 200 psi (140614 KG/m^2); the output pressure shall be set at 12 psi (8437 KG/m^2). Regulator: Attached to each trolley chassis to allow for independent adjustment of each pneumatic collection nozzle. Regulator: Provided with needle type adjustment gauge that is clearly marked with the proper operating range of system.

2.10 UNCOUPLING VALVE ASSEMBLY

Uncoupling Valve Assembly: Activate the release of the pneumatic collection nozzle located on vehicle's exhaust pipe. It shall be a whisker type valve that shall provide a single direction action and affixed to a mounting bracket directly onto the trolley chassis. The valve shall be activated when the whisker switch comes in contact with a disconnect plate located on the side of the rail profile. Disconnect Plate: Provide activation of the uncoupling valve switch mounted on the suction trolley chassis. Disconnect Plate: Capable of being mounted anywhere along the outside of the rail in a manner that allows for easy adjustment. One disconnect plate shall be provided for each trolley that is provided to allow for independent adjustment of exit speeds.

2.11 UPPER FLEXIBLE HOSE

Upper Hose: Flexible exhaust hose manufactured for the sole purpose of venting high temperature exhaust gases. Flexible Hose: Designed strictly for the harsh environment of rapid response and auto-release of a vehicle exhaust tailpipe. Hose: Range from 4 inch (101.6 mm) to 5 inch (127 mm) diameters with length of 25 feet (7.6 m) without joining or splicing connections.

Hose Material: High temperature synthetic rubber impregnated into a high temperature laminated fabric with a minimum overlapping thickness of 2-7/16 inches (61.9 mm). This construction of hose must be capable of operating at continuous temperatures of 400 degrees F (204 degrees C) and intermittent temperatures of 500 degrees F (260 degrees C) such as are experienced when pump checks are performed inside the station. Wire Helix: Bound and protected in laminations of hose winding. This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel. Wear Strip: 9/16 inch (14.28 mm) wide and be provided as a safety yellow color. The bend radius of the high temperature hose shall be no less than 1.5 times the diameter of hose to ensure that hot gases are not restricted as they pass through the system.

2.12 LOWER HOSE ASSEMBLY

Lower Hose: Rigid 4 inch (101.6 mm) to 5 inch (127 mm) diameter by 2 foot (609.6 mm) long section of yellow and black hose identical in appearance to the upper hose assembly. Lower Hose: Support the pneumatic connection nozzle and chrome reducing elbow in a rigid fashion to allow for the operator to place hose collection nozzle onto the tailpipe without bending over. Lower hose is the only section of hose which shall disconnect from the upper hose assembly and act as a safety disconnect in the unlikely event the nozzle gets entangled.

2.13 SAFETY DISCONNECT COUPLING

Safety Disconnect Coupling: 4-part segmented coupling with removable wear strips to protect the vehicle and disconnect from wear shall be incorporated in the design of the system. Coupling: Consist of two spun aluminum collars connected by a reusable-segmented coupling band. The release tension of this device shall be preset at 130 pounds and adjustable from 20 pounds to 206 pounds of separating force to accommodate varying exit speeds of vehicles. Coupling: Reusable.

2.14 COLLECTION NOZZLE ASSEMBLY

Collection Nozzle Assembly: Provide a substantially air tight seal around exhaust tail pipe when connected thus allowing for 100% source capture. The seal shall not allow for escape of life threatening exhaust gases, which may be present during the following conditions:

1. In the event vehicle's engine is accelerated above normal idle resulting in an exhaust velocity greater than 5000 feet per minute (25.4 meters per second).
2. In the event that the output velocity or CFM of the exhaust exceeds the manufacturers normal capture velocity or CFM of exhaust system.

Nozzle: Automatically adjust its internal orifice to accept any tailpipe ranging from one inch through six-inch (152.4 mm) diameter. Nozzle Pressure: Not exceed 15 psi (10546 KG/m^2). when connected to the vehicle's tailpipe. Nozzle Construction: High temperature synthetic rubber vulcanized to a high temperature synthetic fabric. A NOMEX inner liner shall be provided for the primary temperature source at the tailpipe to act as a friction barrier. The chrome-reducing elbow that connects to the connection nozzle shall be fabricated using continuous welded construction. Angle of Transition: No less than or greater than 67 degrees from the centerline of the reducer. Chrome Reducer: Incorporate a primary expanded metal debris screen, which is permanently affixed by welded seams to the inside opening of exhaust fitting.

2.15 MANUAL FILL VALVE

Manual Connection Fill Valve: Located 6 inches (152.4 mm) above safety release coupling approximately 4 feet (1219.2 mm) from floor, sliding/push button type for manual or automatic release. In its design this valve shall incorporate in its design a handle which the operator may easily operate in a standing position. The attachment of the collection nozzle shall not position the operator's breathing zone closer than 36 inches (914.4 mm) from the exhaust tailpipe. The automatic release of the connection valve shall be no greater than 3 psi (2109 KG/m^2) shift pressure to activate the automatic nozzle deflation. Primary Air Supply: Accomplished by means of a compression type fitting. The regulated air supply line to collection nozzle shall be designed to safely release from the upper hose at a pressure no greater than 80 lbs. (362.8 KG)

2.16 COMPRESSED AIR FEATURES

Airlines: ¼ inch (6mm) OD tubing capable of exposure of high temperature air stream inside the ventilation hose and duct. Airlines: Fed through the exterior of the hose through Teflon and brass grommets. Airlines: Fed through the exterior of the duct through high temperature rubber grommets to protect against abrasion. Unless a fire station air compressor is to be utilized the

bidder shall provide a quiet operating compressor to be located proximate to the vehicle bays. It shall also be located so that preventative maintenance can be performed quickly and effectively. The operation of the compressor running inside station shall not generate sound decibels in excess of 50 dB. The compressor shall be equipped with a filter/dryer to ensure the conveyance of clean dry air to the pneumatic controls incorporated in the auto-release ventilation system.

2.17 HOSE SADDLE

Hose Suspension Saddle: Fabricated of a rubber molded cushion specifically manufactured for the sole purpose of suspending high temperature exhaust ventilation hose in a rapid response and auto-release application. The design of the saddle shall smoothly transition the direction of the hose during its travel along the track. Securing clamps shall be provided including a link fastener, for the purpose of mounting it to the balancer safety link.

2.18 VSR RAIL MATERIAL

Rail Material: One-piece continuous extruded aluminum rail in a minimum length of 19 feet (580 mm). Construction Profile: Rectangular profile , rail height of 10 inches (254 mm) including the rubber seals, rail thickness of 0.20 inch (5 mm), width of 8-½ inches (216 mm) id. Bottom Portion of Rail: Continuous slots to accept a rubber seal. Rubber Seals: Fitted into each side of the rail and shall join in the middle. Rail Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M). Rail: Extruded as a one piece design unit to maximize the structural integrity of the rail and to minimize joints which may add to possible leakage of dangerous exhaust gases.

2.19 TRAPEZE MOUNTING SUPPORT

Trapeze Mounting Support: Supplied by the manufacturer to ensure the integrity of the installation. A minimum of one trapeze support with appropriate bracing shall be provided for every 10 linear feet (3048 mm) to 12 lineal feet (3658 mm) of rail profile. Trapeze Mounting Support: Free floating side to side track assembly and have a minimum travel of 18 inches (457 mm) from the natural rest position center line from the exhaust stack. The range of travel shall be set by 2 end stops with rubber bumpers. This shall be accomplished by the use of a Boxloc track provided with ball bearing trolleys secured to the rail by safety links. The Boxloc track shall be suspended from the ceiling by the use of a support leg assembly. Support Leg Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M). Supports shall come standard in 19 foot (579 mm) lengths. The support legs shall consist of a square tubular profile with dimensions no less than 2 inch (50.8 mm) OD by 0.1 inch (2.54 mm) with 0.4 inch (10mm) fastening hardware provided. Vertical Adjustable Mounting Foot: Capable of attaching the leg assembly to a ceiling with a 30 degree pitch, complete with a slider bar and 3/8 inch (9.5 mm) hardware necessary for attaching the leg assembly to the mounting channel of the Boxloc track. Support Leg: Equipped with a round tubular zinc-plated steel knee brace with pressed ends in standard lengths of 20 inches (508 mm), 30 inches (762 mm) and 72 inches (1829 mm). Angle: Completely adjustable to the leg support and mounted perpendicular and parallel to the direction of the track. Typical Support Angle: 45 degrees from the centerline of the factory provided support leg. Rail: Provided with safety cables as a secondary safety device.

2.20 RAIL SPLICING JOINT

Rail Splicing Joint: Formed steel fitting equal to the internal diameter of the suction rail profile. The splice shall have a wall thickness of no less than 0.190 inch (4.8 mm)in thickness and a length of no less than 8 inches (203.2 mm) from end to end. Rail Splicing: Safely secured by no less than 16-3/8 inches (416 mm) x 1-½ inch (38.1 mm) bolts, nuts and lock washers. Each bolt shall pass through the exterior of the rail profile and splicing joint and shall be secured on the inside by a lock washer and nut. Self tapping bolts or screws are not acceptable.

2.21 FLEXIBLE DUCT CONNECTION

Flexible Duct Connection: With one end formed to fit a six inch diameter flexible duct pipe located on the top side of the rail. Included with this fitting shall be a flexible hose manufactured of 600 degree Teflon construction with an overall length of five feet. The rail duct connection shall be a 6 inch (152.4 mm) diameter round transition fitting fabricated from 20 gauge galvanized steel (ASTM A653/A653M).

2.22 VERTICAL STACK ADAPTER

Vertical Stack Adapter: Zinc plated steel specially designed to be accepted into the exhaust extraction rail. The outlet dimension of the vertical stack adapter must equal the outlet dimension of the stack exhaust system provided on the apparatus. Adapter: Secured to the exhaust stack

by means of a female pipe connection with 2- 0.3 inch (8mm) hex head bolts utilized as "jack bolts".

2.23 ELECTRICAL CONTROLLERS

A. Controller: Built and supplied by a UL recognized and listed exhaust system manufacturer. Controller shall carry the UL - CUL listing label as an "Enclosed Industrial Control Panel." Individual components listed by UL - CUL shall not satisfy the above requirement. Manufacturer shall undergo monthly inspections by UL to verify all requirements and standards are met as outlined by UL. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications to follow.

B. Electrical Controllers: Bear a visible UL listing label as proof of subscribership and shall be validated by UL www.ul.com/database/ as an "Enclosed Industrial Control Panel". Certification documents shall accompany bid documents.
   1. Manufacturer Name: _____
   2. UL File No.: _____
   3. Electrical controller and manufacturer shall be recognized and listed by UL. Controller shall be manufactured in accordance with Underwriters Laboratories standard UL-508 for "Enclosed Industrial Control Panels". The electrical controller shall include a Class 1 limited energy control circuit. Enclosures shall be NEMA 12 rated and UL listed as Type 12. The electrical control components shall be provided and mounted in an electrical enclosure to restrict access to internal components of the controller by authorized personnel only.

C. Controller Performance: Designed to sense the output pressure and temperature change inside the ductwork system, which is normally generated by any internal combustion engine designed to propel a motor vehicle. The operating logic shall be designed to complete this cycle. At any point in time when a collection device is connected to a motor vehicle's exhaust tailpipe, as the operator starts the vehicle, the controller shall automatically sense the engine's output pressure or temperature of the exhaust and in turn energize the electrical contactor which will supply power to the AMCA certified spark resistant fan motor. Through the use of an adjustable timer the controller shall keep the contactors energized for up to six minutes in accordance with the stations response requirement. If the responding vehicle does not disconnect from the exhaust ventilation system in less than the designated setting, the temperature override switch shall override the time delay to ensure continuous system operation. This automated function will work for as long as the exhaust gas temperature is in excess of the setting on the heat sensor located in the ductwork system. This cycle shall not allow the electrical contactor, which energizes the exhaust fan, to short cycle or stop the fan while the system is connected to an operating vehicle.

D. Motor Control Contactor: Allen Bradley Industrial Electrical Contactor 100C series. The contactor shall be UL - CUL listed as an approved component.

E. Motor Control Overload Relay: Allen Bradley 193 ES series. Overload relay shall have an adjustable trip range to meet the proper full load amperage of the blower motor.

F. Soft Touch Controls: Incorporated on the face or the access door of the controller by the use of an adhesive backed Lexan membrane type label to prevent water infiltration, which would void the NEMA 12R rating. Label: Provided and secured permanently to the exterior of the electrical controller. Label: Include the name of the manufacturer, address, telephone number, user instructions and any warnings or cautions required by Underwriters Laboratories.
   1. Auto Start: This mode of operation shall be strictly for normal day to day use, as it would apply to receiving an emergency call and leaving the station. Any one or combination of the three devices listed below in Paragraph H shall activate the system. The system shall maintain itself in the Auto Start mode and always return there after the Stop sequence has been initiated. The controller shall not have a permanent off position due to the potential health hazards of diesel exhaust components.
   2. Stop: This mode of operation shall be a system override to shut down the system manually. Upon activating this mode of operation the exhaust system blower shall shut down. After a period not to exceed three seconds the controller shall automatically return to the Auto Start ready mode. This shall be a safety feature to prevent a potential health hazard from carcinogenic diesel exhaust leakage from systems having an undesirable open nozzle.
   3. This mode of operation shall be a system override to run the exhaust system blower continuously for the purpose of running the vehicles indoors for equipment checks during inclement weather. Upon activating this mode of operation the exhaust system blower shall

start and run continuously until the Stop mode is activated at which point the system will automatically return to the Auto Start ready mode within a maximum three second time period.

G. System Indicator LED's: Show system status at all times.
1. Auto Start Indicator: Indicate the system is in the fully automatic mode of operation and that power is on to the controller.
2. Fan On Indicator: Indicate that power is being applied to the system blower and the controller is operating normally.
3. Filter Status Indicator: Indicate, if flashing, excessive pressure loss across the filter bank media. Consequently the filter must be serviced to maintain optimum efficiency of the system.
4. Stop Indicator: Indicate the fan has been manually de-energized and will return to the Auto Start ready sequence in less than three seconds to prevent the system blower from being left in the Off mode.
5. Manual Run Indicator: Indicate the fan is operating in a continuous run mode until interrupted by the stop mode activation.

H. Controller Transformer: UL listed industrial control circuit transformer sized to properly supply all components so that only one transformer shall be required. Transformer shall be provided with multi-tap primary for 115, 208, 240, 277, 400, 480, and 600VAC, and 24, 120, 230VAC secondary operating on 50 or 60 hertz with a capacity of 90 volt amperes.

I. Control Circuit Protection: By the use of primary and secondary fuses (NEC code ref. 430-72) to meet UL requirements. The primary shall be protected by a pair of FLQ style fuses rated at 1.6 amps for voltages under 400V and a pair of .75 amp fuses for voltages over 400V. The primary fuse holder shall have a standard indicator light feature to aid in troubleshooting blown fuses. A single glass fuse rated at 3 amps at 250V shall protect the secondary side of the control circuit.

J. Electronic Control Circuit Card: Solid state printed circuit board. The soft controls shall be an integral part of the control circuit card. The control circuit card shall utilize a potentiometer to adjust the length of the timing cycle from 7 to 360 seconds. It shall incorporate several different modes of operation and optional features.

K. Activation Devices:

1. Engine Start Switch: An engine pressure sensing type, capable of recognizing the output pressure of any type of motor vehicle exhaust. The electrical contact shall be dry type or not to exceed 24V ac. There shall be one sensor per vehicle.
2. Thermal Start Switch: Temperature sensing switch of the snap disc type and adjustable from 90 degrees F (32 degrees C) to 130 degrees F (55 degrees C) to configure the system based on different exhaust temperatures. There shall be one sensor per vehicle.
3. Remote Control Transmitter and Receiver: Shall be an optional feature with three independent channels of control. The receiver shall operate on 12V to 24 V AC or DC. The handheld transmitter shall be molded out of a highly visible orange composite with a visor clip on the back making it rugged and easy to locate. It shall be powered by a 9 volt battery for ease of replacement and cost savings. Utilizing three sets of normally open and normally closed contacts allows the device to be used to control three separate functions from up to one quarter of a mile away.

    a. Channel A: Shall be capable of starting and stopping the exhaust system blower.
    b. Channel B: Shall be capable of operating the apparatus bay door upon entering or leaving the fire station, if desired.
    c. Channel C: Shall be capable of remotely controlling the traffic signal in front of the fire station, if so equipped.

L. Clean Filter Indicator Alarm: Used in conjunction with the optional Unifilter for filtering diesel exhaust particulate before release to the atmosphere. The clean filter indicator shall monitor the pressure loss across the filter bank media. Once the useful life of the filter has been depleted the pressure differential switch will signal a high-pressure loss and flash the "Fan On" indicator while the exhaust blower is running.

M. Remote Alarm: Shall be an optional feature to monitor the system and advise when a preset number of emergency runs on the system have accrued.

N. No Airflow Alarm: Shall be an optional feature to monitor the system and advise when the exhaust fan is not functioning properly.
O. Carbon Monoxide Alarm: Shall be an optional feature to monitor the carbon monoxide levels inside the apparatus bay area.
P. Electrical Wiring: Run in wire channel to allow for easier identification of the wiring circuits and for a neat appearance. All wiring circuitry shall meet International Electrical Code and UL standards for proper size, bending radiuses (International Electrical Code) and terminations.
Q. Electrical Terminal Block: 600 V, UL rated and recognized. It shall provide individual connection points for remote controls, clean filter indicator and power connections. The primary and secondary control wiring fuses shall be incorporated into the terminal block as one unit.
R. Product Manual: Shall be provided with each electrical control box supplied. The product manual shall include a description of components with part numbers inclusive to the controller. It shall include a wiring schematic showing all internal circuitry as well as all field installed wiring connections to the controller.
S. Electrical Interference: To protect the apparatus and communications, designs that allow any possibility of electrical back-feed or induced current which may interfere with a central services communication or onboard vehicle computer logic or navigational equipment will not be accepted.

2.24 ELECTRICAL SYSTEM

A. Station Electric Supply Panel: The power circuit for the "Emergency Response Vehicle Exhaust Removal System" shall originate in a circuit breaker panel board of the appropriate size to handle the load. Fan circuit shall be supplied by a UL listed, HACR rated circuit breaker (HACR rating is specifically for motor type loads) of the same type as indicated by the manufacturer of the circuit breaker panel or a dual element time delay fuse for fuse style panels. The circuit shall be clearly marked on an engraved ledger plate or in ink on the panel schedule as "Emergency Response Vehicle Exhaust Removal System".
B. OS-3 Automatic Controller: Built and supplied by a UL recognized and listed exhaust system manufacturer. Controller shall carry the UL - CUL listing label as an "Enclosed Industrial Control Panel". Individual components listed by UL shall not satisfy the above requirement. Manufacturer must undergo monthly inspections by UL to verify all requirements and standards are met as outlined by UL. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications in 2.17 Electrical Controllers. The controller shall be mounted 6 feet (1829 mm)to the top of the cabinet AFF (above finished floor). A safety disconnecting means must be within sight of the controller for servicing and for safety reasons. If the supply panel is not within sight, a separate disconnecting means is required beside the controller (NEC code ref. 430-102 (a). Safety disconnect shall be capable of being locked in the off and on position to follow lockout, tag out procedures. See attached Table 1-1 for proper Square D part number of safety disconnect switch.
C. Power Wiring Conduit: Minimum of EMT utilizing compression type fittings for damp locations such as apparatus wash down areas (International Electrical Code). Conduit shall be supported with a conduit strap every 10 feet (3 m) and within 3 feet (914.4 mm) of each box or termination, (International Electrical Code and local modifiers.).
D. Power Wiring from Supply Panel to OS-3: THHN stranded copper wire consisting of a flame retardant, heat-resistant thermoplastic insulation with a nylon jacket for abrasion, gas, and oil resistance and rated up to 600 volts.
E. Low Voltage Control Wiring: Minimum of a 14/2 multi-conductor shielded cable (Anixter part number #2AS-1401POS or equivalent) to meet UL standards for the controller's low voltage field wiring. Termination procedure shall be as follows; the shielded cable shall be stripped back inside the control cabinet, the mylar foil shield and silver drain wire are to be twisted together and secured under the screw in the grounding lug inside the control cabinet. Terminations at each sensor must leave foil shielding and drain wire intact and at no point shall it come into contact with ground. There shall be only one connection to ground.
F. Low Voltage Control: Encased in a minimum of ½ inch (12.7 mm) EMT from the OS-3 Controller to the attic or building steel where it shall terminate with an EMT connector with a threaded plastic bushing. Conduit: Supported with a conduit strap every 10 feet (3048 mm) and within 3 feet (914.4 mm) of each box or termination (International Electrical Code). The 14/2 multi-conductor shielded cable (Anixter part number #2AS-1401POS or equivalent) shall be supported by the building structure and ran in a manner that the cable will not be damaged by normal building use

(International Electrical Code and local modifiers.), securely fastening it with nylon tie wraps every 24 inches (609.6 mm) to 36 inches (914.4 mm). Draping of the cable perpendicular to building steel or support members will be unacceptable.

G. Power Wiring from OS-3 to Fan Motor: Minimum of EMT utilizing compression type fittings for damp locations such as apparatus wash down areas (NEC code ref.348-10). Conduit shall be supported with a conduit strap every 10 feet (3048 mm) and within 3 feet 914.4 mm) of each box or termination (International Electrical Code and local modifiers.). Conduit shall extend through the outside wall through a hole of the proper size and terminate directly into the back of the safety disconnect with the appropriate connector and sealed with a silicon sealer or cement mortar. (Using fan model number select appropriate wire and conduit size from Table 1-1).

H. Fan Safety Disconnect: Square D, non-fusible, NEMA 3R rated for wet locations, mounted adjacent to the AMCA Certified blower. Safety disconnect shall be capable of being locked in the off and on position to follow lockout, tag out procedures. (Using fan model number select appropriate safety disconnect from attached Table 1-1).

I. Liquid Tight Flexible Metal Conduit: UL listed liquid tight flexible metallic conduit (Sealtite). Conduit will encase the load wires and ground wire from the safety disconnect switch to the blower motor. Conduit length not to exceed 4 feet (1219.2 mm) from disconnect to blower motor. The appropriate listed terminal fittings shall be used. (NEC code ref.351-7) (Using fan model select appropriate conduit size from attached Table 1-1).

J. Spark Resistant Blower: AMCA B certified, designed and installed as a direct drive spark resistant blower (IMC code ref. 503.2). The motor shall meet current EPACT standards for energy savings. Fans utilizing steel housings and impellers will not be accepted.

K. Temperature Switch: One for each apparatus connected to the system. The temperature switch shall be of the snap disc type and adjustable from 90 degrees F (32 degrees C) to 130 degrees F (54 degrees C). It shall be mounted on the ductwork 2 inches (50.8 mm) above the pressure switch by drilling a 1 inch (25.4 mm) hole, sealing the switch with silicon sealant and securing with 2 tek screws. Electrical connection shall be made with terminals provided or solder less type such as Thomas & Betts part no. 14RB-2577 or equivalent.

L. Pressure Switch: One for each apparatus connected to the system. The pressure switch shall operate at a maximum of 24VAC, pre-calibrated at .18 in. of water column. Mounting shall be accomplished by drilling a 3/8 inch (9.5 mm) hole 3 inches 76.2 mm) above the riser bracket and to the left of the regulator and threading the switch into the duct. The electrical connections shall be made with a 0.020 inch (.5 mm) by 0.187 inch (4.8 mm) female quick disconnect terminals, such as Thomas & Betts part no. 14RBD-18277 or equivalent.

Three Phase										
67006	5hp	208	12.8	7060	20	#10	0' (0 m)	187' (57 m)	1/2" (12.7 mm)	DU321R
	Leesc					#8	188' (57 m)	298' (91 m)	1/2" (12.7 mm)	DU321R

Manufacturer assumes no liability for any electric installation; all local, city, and the National Electric Code must be followed. This chart was calculated for a maximum voltage drop of 3% and is to be used as a guideline.

2.25 AIR MOVING DEVICES

A. Centrifugal Fans: Direct drive centrifugal type, high pressure, single width, single inlet as required or indicated. Impeller Wheels: Backward incline design for high static pressure performance, spark resistance and made of Almag material to prevent static electricity build up. The impeller shall be dynamically and statically balanced and of the non-overloading type to provide maximum efficiency while achieving quiet, vibration-free operation. The fan housing shall be manufactured from steel with a powder coated epoxy finish. The outlet configuration shall be top horizontal, bottom horizontal, or up blast. The housing shall be capable of field reconfiguration in the event

the mounting position needs to be changed for unforeseen reasons. The base shall have four (4) pre punched openings at bottom of fan base for field attachment to either an exterior wall or roof mounting structure.

B. Fan Motor and Bearing: All 1 horsepower (746 watts) to 15 horsepower (11190 watts) motors shall be totally enclosed fan cooled (TEFC) continuous duty rated. The motors shall be dual voltage where applicable. Motors built after October 27th, 1997 shall comply with the government mandated "Energy Policy and Conservation Act" (EPACT) as outlined by the Department of Energy. The bearings shall be self-aligned, ball bearing type permanently sealed and lubricated. The exhaust discharge outlet shall be in compliance with International Mechanical Code and ACGIH recommendations (min. of 36" above roofline). Air intakes, windows, cascade systems, prevailing currents, communication equipment and building aesthetics shall be considered in the final location of the fan.

1. Teflon Shaft Seal: The fan shaft shall be steel and rotate in a non-sparking TEFLON seal to prevent leakage and to prevent hot exhaust gases from coming into contact with the motor bearings.
2. Variable Speed Drive: The motor shall be compatible with a variable speed drive unit.

C. Performance: The delivered volume shall take into account all the static regain of vehicle engine exhaust (based on an airtight connection at the tailpipe), lengths of ductwork, elbows, branches, shut off, wyes, etc. which accumulate the static pressure at the field inlet. The manufacturer's provided fan(s) shall be performance guaranteed.

1. Fan Capacity: The Fan Capacity shall be sized as such as to deliver the required CFM at each hose drop to which the vehicle is attached.

   a. The 4 inch (101.6 mm) hose system shall be designed to deliver a minimum of 500 CFM (2.9 M/Second) at a velocity of 5800 FPM (33.6 M/Second) at the hose and nozzle connection.
   b. The 5 inch (127 mm) hose system shall be designed to deliver a minimum of 750 CFM (4.4 M/Second) at a velocity of 5800 FPM (33.6 M/Second) at the hose and nozzle connection.
   c. The 6 inch (152.4 mm) system shall be designed to deliver a minimum of 1100 CFM (6.4 M/Second) at a velocity of 5800 FPM (33.6 M/Second) at the hose and nozzle connection.

D. Location: The preferable fan location shall be on the outside of the fire station as far away from any living quarters as possible so that firefighters would not be disturbed by the system activation. No blower fans shall be mounted inside the fire station. Silencers shall be provided when fan sound pressure level exceeds 64 dB.

2.26 DUCTWORK SYSTEM

A. Ductwork Type and Materials: UMC Class 2 or SMACNA Class II product conveying duct, meet or exceed criteria for construction and performance as outlined in Round Industrial Duct Construction Standards, SMACNA. Materials of construction unless otherwise specified for all ductwork and fittings shall be a minimum G-90 galvanized sheet metal (ASTM A653/A653M). Only when specified, Type 304 stainless steel (ASTM A240/A240M) shall be provided.

B. Ductwork Sizing and Gauges: Round pipe construction, with the range of available sizes not to exceed 10 inches (254 mm) in diameter. Duct gauge shall depend on diameter and a minimum operating pressure of 8 inches water gauge (1990 Pa). Acceptable Gauge and Reinforcement Requirements: Inner duct diameter 4 inches (101.6 mm) through 11 inches (279.4 mm) diameter shall be 22 gauge standard pipe (International Mechanical Code).

C. Ductwork Fittings: Round and have a wall thickness 2 gauges (one even gauge number) heavier than the lightest allowable gauge of the downstream section of duct to which they are connected (International Mechanical Code). Air Duct Branch Entrances: Factory fabricated fittings or factory fabricated duct /tap assemblies. Fittings: Constructed so that air streams converge at angles no greater than 45 degree (International Mechanical Code). All Seams: Continuous stitch welded and if necessary internally sealed to ensure air tightness. Turning elbows shall be stitch-welded and used for all diameters and pressures. They shall be fabricated of 24 gauge galvanized steel and constructed as two piece with continuous welded seam construction fittings

similar to those provided by Lindab Inc. Tapered Body Fittings: Used wherever particular fallout is anticipated and where air flow is introduced to the transport duct manifold.

D. Ductwork Design Velocities: Minimum of 3500 FPM (20.3 M/Second) to 4000 FPM (23.2 M/Second) transport velocity. Capture Velocity: 5500 FPM (31.9 M/Second) to 6000 FPM (34.8 M/Second) to extract 100 percent of the exhaust gases.

E. External Ductwork: Sized for the exact inlet and outlet of the exhaust fan blower. An exhaust rain cap shall be supplied and manufactured in accordance with EPA standard for free draft rain cap requirements. Included as an integral part of this rain cap shall be a back draft damper to provide protection from rain and other inclement weather.

F. Exhaust Penetrations: The core drilling shall be properly sized to reduce the diameter of the opening to the smallest possible size.

2.27 SLIDING TRACK

A one-piece continuous extruded aluminum track in a minimum length of 19 feet (5791.2 mm). Profile shall be of a Boxloc type profile, track height 3-1/8 inches (73.4 mm), track width 1-½ inches (38.1 mm), track thickness 1/8 inch (3.175 mm); aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M). Track: Extruded design that shall incorporate three separate and functioning channels. Channels: Includes the mounting channel, the trolley channel and the Boxloc channel. Mounting Compartment: Designed to accept the slider bars (which shall be provided with factory supplied vertical support legs and riser clamp duct connection) and to allow positioning along the full length of the slotted track-mounting channel. Mounting Channel: Also accommodate the compressed airlines for the purposes of safe storage and appearance. Trolley Channel: Allow the trolley/balancer/ hose assembly to glide to the door threshold in a safe and effective manner. Boxloc Channel: Allow the whole track to remain rigid as it hangs from factory supplied leg supports and also shall provide an area to attach bolts for splicing additional tracks together for systems over 19 feet (5791.2 mm) long. The overall extruded track lengths shall be 19 foot standard and shall weigh no more than 35 pounds (15.88 KG). The track system shall be equipped with end stops that limit travel of flex hose as the vehicle exits the building. The end stop shall be fabricated of zinc plated steel in a U shape form with a rubber end stop on the impact end. It shall be attached by using a ¼ inch (6.35 mm) molded locking bolt. The end stop shall be secured to the track with no less than (2) ¼ inch (6.35-mm) bolts and locking nuts located on the underside of the track. For security, a ¼ inch 6.35 mm) bolt shall be drilled through the ends of each track system to ensure that the trolley/balancer assembly(s) roll no further than the end of the track system.

2.28 SUPPORT LEGS

Support Leg and Mounting Feet: Manufactured and provided by the supplier of primary exhaust removal system (Equipment Manufacturer). Leg Material: Aircraft aluminum alloy Type AA-6063 (ASTM B209/B209M). Supports shall come standard in 19 feet (5791.2 mm) lengths. A minimum of one support with appropriate bracing shall be provided for every 10 linear feet (3048-mm) of track profile. The support legs shall consist of a square tubular profile with dimensions no less than 2 inch (50.8 mm) OD X 0.1 inch (2.54 mm) with 0.4 inch (10mm) fastening hardware provided. Vertical Adjustable Mounting Foot: Capable of attaching the leg assembly to a ceiling with a 30 degree pitch, complete with a slider bar and 3/8 inch (9.5 mm) hardware necessary for mounting the horizontal track to the mounting channel system. Horizontal Adjustable Mounting Foot: Capable of attaching the leg assembly to a wall, complete with a slider bar and 3/8 inch (9.5 mm) hardware necessary for mounting the horizontal track to the mounting channel system. Support Leg: Equipped with round tubular zinc-plated steel knee brace with pressed ends in standard lengths of 20 inches (508 mm), 30 inches (762 mm) and 72 inches (1828.8 mm). Angle completely adjustable to the leg support and mounted perpendicular and parallel to direction of the track. Typical Support Angle: 45 degrees from the centerline of the factory provided support leg. The standard leg shall be capable of meeting a Seismic 4 requirement.

2.29 DOUBLE TRACK JOINER PLATE

Joiner Plate: constructed from a minimum of ¼ inch (6.35 mm) thick zinc-plated material, designed to connect two parallel tracks to make a double track system to accommodate an apparatus bay over 40 feet (12192 mm) in length. Joiner Plate: 10 inch (254 mm) by 8 inch (203.2 mm) flat zinc-plated steel and designed to attach the two tracks to a single factory supplied support leg. The steel plate shall have (6) 3/8 inch (9.5 mm) holes drilled 6-7/8 inches (174.6 mm) apart to accommodate the slider bar provided with factory support legs. Joiner Plate: Have

two slider bars attached to the plate, located on the outside edges of the plate. These slider bars shall fit into the Boxloc track-mounting channel for a simple and secure attachment of the plate to the Boxloc track. The center portion of the joiner plate shall provide attachment for the factory supplied support leg.

2.30 TRACK SPLICING ASSEMBLY

Track Splice: Manufactured of galvanized steel (ASTM A653/A653M) in two parts and utilized as a clamping device. This clamp shall accurately secure both tracks together in a fashion, which shall eliminate any possibility of obstructing the trolley assembly as it passes through this connection point of track system. Connecting length of splice shall be a minimum of 15-3/4 inches (400 mm) long and fabricated of 14-gauge material. Four (4) 1/4-inch (6.35 mm) bolts with lock nuts shall pass directly through internal partition of the Boxloc track. The splicing sleeve shall fit externally around the outside dimension of extruded aluminum track profile.

2.31 RISER CLAMP ASSEMBLY

Riser Clamp: Fabricated as a one piece welded assembly, manufactured to create the transfer of the hard spiral pipe joined at the top and flexible duct connection at the bottom. The riser clamp shall be pre-drilled to mount an air regulator assembly for the pneumatic nozzle and to accept airlines that pass through airtight seals mounted to riser pipe. A slider bar and associated hardware shall be provided with riser clamp assembly. Sizes of the riser clamp will range from 4 inches (101.6 mm) to 5 inches (127 mm) in diameter to match the output velocity of the vehicles that will park in that station.

2.32 TROLLEY/BALANCER ASSEMBLY

Trolley Assembly: Manufactured as a two piece galvanized steel assembly including bumper stops at each end. Fixed to the side of the trolley are solid steel pins, which shall be for load carrying bearings that are sealed and permanently lubricated. The load carrying bearings shall travel internally in track trolley channel. Two additional permanently lubricated trolley wheels shall be provided on bottom side of the track to reduce wobble of trolley as it conveys the hose assembly to the door threshold. Release Plate: Attached to the chassis of the trolley to smoothly energize the uncoupling release valve when the trolley-balancer assembly approaches the door threshold. System Balancer Assembly: Self-adjusting weight spring tension balancer with a lifting capacity of no less than 31 pounds (14 KG). The balancer shall have a minimum diameter stainless steel cable of .080 inch (2 mm), safety link connection.

2.33 REGULATOR ASSEMBLY

Regulator: Safely operate with an input pressure of 0 psi (0 KG/m^2)- 200 psi (140614 KG/m^2); the output pressure shall be preset at 15 psi (10546 KG/m^2). Regulator: Attached to each Riser Clamp Assembly/Hose Drop or to the Boxloc track to allow for independent adjustment of each pneumatic nozzle. The regulator shall also be provided with needle type adjustment gauge that is clearly marked with the proper operating range of the system and the gauge shall be visibly read from standing on the bay floor.

2.34 UNCOUPLING VALVE ASSEMBLY

Uncoupling Valve Assembly: Provided to activate the release of the pneumatic nozzle connection to the vehicle's exhaust pipe, single direction action and affixed to a mounting bracket, which can be easily positioned and adjusted along the full length of the extruded aluminum track profile. Mounting Bracket: Formed from a minimum of 16 gauge galvanized steel and designed to fit snugly over the top of the Boxloc track system. A ¼ inch (6.35 mm) opening shall be centered to the top side of bracket to accommodate a ¼ inch by 1 inch (25.4 mm) bolt with a ¼ inch 6.35 mm) thick plated 1-½ inch (38.1 mm) long bar providing the secure attachment of the Uncoupling Valve. When the system is put into service the release valve shall be set for the maximum exiting speed of the vehicle.

2.35 UPPER FLEXIBLE HOSE

Upper Hose: Flexible exhaust hose manufactured for the sole purpose of venting high temperature exhaust gases. Flexible Hose: Designed strictly for the harsh environment of rapid response and auto-release of a vehicle exhaust tailpipe. Hose: Range from 4 inch (101.6 mm) to 5 inch (127 mm) diameters with varying lengths depending on the system length required ranging from 20 feet 6096 mm) to 43 feet (13106 mm) without joining or splicing connections. Hose Material: High temperature synthetic rubber impregnated into a high temperature laminated fabric with a minimum overlapping thickness of 2-7/16 inches (61.9 mm). This construction of hose must be capable of operating at continuous temperatures of 400 degrees F (204 degrees C) and

intermittent temperatures of 500 degrees F (260 degrees C) such as are experienced when pump checks are performed inside the station. Wire Helix: Bound and protected in laminations of hose winding. This shall be accomplished in a fashion, which eliminates any possibility of personnel coming in contact with an exposed hot metal helix. The hose shall further protect the internal wire helix from heat buildup and in turn add increased visibility to personnel. Wear Strip: 9/16 inch (14.28 mm) wide and be provided as a safety yellow color. The bend radius of the high temperature hose shall be no less than 1.5 times the diameter of hose to ensure that hot gases are not restricted as they pass through the system.

2.36 LOWER HOSE ASSEMBLY

Lower Hose: Rigid 4 inch (101.6 mm) to 5 inch (127 mm) diameter by 2 foot (609.6 mm) long section of yellow and black hose identical in appearance to the upper hose assembly. Lower Hose: Support the pneumatic connection nozzle and chrome reducing elbow in a rigid fashion to allow for the operator to place hose collection nozzle onto the tailpipe without bending over. Lower hose is the only section of hose which shall disconnect from the upper hose assembly and act as a safety disconnect in the unlikely event the nozzle gets entangled.

2.37 SAFETY DISCONNECT COUPLING

Safety Disconnect Coupling: 4-part segmented coupling with removable wear strips to protect the vehicle and disconnect from wear shall be incorporated in the design of the system. Coupling: Consist of two spun aluminum (ASTM B209/B209M) collars connected by a reusable-segmented coupling band. The release tension of this device shall be preset at 130 pounds (59 KG). And adjustable from 20 pounds (9 KG) to 206 pounds (93 KG) of separating force to accommodate varying exit speeds of vehicles. Coupling Reusable.

2.38 COLLECTION NOZZLE ASSEMBLY

A. Collection Nozzle Assembly: Provide a substantially air tight seal around exhaust tail pipe when connected thus allowing for 100% source capture. The seal shall not allow for escape of life threatening exhaust gases, which may be present during the following conditions:

1. In the event vehicle's engine is accelerated above normal idle resulting in an exhaust velocity greater than 5000 feet per minute (25.4 meters per second).
2. In the event that the output velocity or CFM of the exhaust exceeds the manufacturers normal capture velocity or CFM of exhaust system.

B. Nozzle: Automatically adjusts its internal orifice to accept any tailpipe ranging from one inch through six-inch (152.4-mm) diameter. Nozzle Pressure: Not to exceed 15 psi (10546 KG/m^2) when connected to the vehicle's tailpipe. Nozzle Construction: High temperature synthetic rubber vulcanized to a high temperature synthetic fabric. A NOMEX inner liner shall be provided for the primary temperature source at the tailpipe to act as a friction barrier. The chrome-reducing elbow that connects to the connection nozzle shall be fabricated using continuous welded construction. Angle of Transition: No less than or greater than 67 degrees from the centerline of the reducer. Chrome Reducer: Incorporate a primary expanded metal debris screen, which is permanently affixed by welded seams to the inside opening of exhaust fitting.

2.39 MANUAL FILL VALVE

Manual Connection Fill Valve: Located 6 inches (152.4 mm) above safety release coupling approximately 4 feet (1219.2 mm) from floor, sliding/push button type for manual or automatic release. In its design this valve shall incorporate in its design a handle which the operator may easily operate in a standing position. The attachment of the collection nozzle shall not position the operator's breathing zone closer than 36 inches (914.4 mm) from the exhaust tailpipe. The automatic release of the connection valve shall be no greater than 3 psi (2109 KG/$m^{2)}$. Shift pressure to activate the automatic nozzle deflation. Primary Air Supply: Accomplished by means of a compression type fitting. The regulated air supply line to collection nozzle shall be designed to safely release from the upper hose at a pressure no greater than 80 lbs. (362.8 KG)

2.40 COMPRESSED AIR FEATURES

Airlines: ¼ inch (6mm) OD tubing capable of exposure of high temperature air stream inside the ventilation hose and duct. Airlines: Fed through the exterior of the hose through Teflon and brass grommets. Airlines: Fed through the exterior of the duct through high temperature rubber grommets to protect against abrasion. Unless a fire station air compressor is to be utilized the bidder shall provide a quiet operating compressor to be located proximate to the vehicle bays. It shall also be located so that preventative maintenance can be performed quickly and effectively.

The operation of the compressor running inside station shall not generate sound decibels in excess of 25 dB. The compressor shall be equipped with a filter/dryer to ensure the conveyance of clean dry air to the pneumatic controls incorporated in the auto-release ventilation system.

2.41 HOSE SADDLE

Hose Suspension Saddle: Fabricated of a rubber molded cushion specifically manufactured for the sole purpose of suspending high temperature exhaust ventilation hose in a rapid response and auto-release application. The design of the saddle shall smoothly transition the direction of the hose during its travel along the track. Securing clamps shall be provided including a link fastener, for the purpose of mounting it to the balancer safety link.

2.42 ELECTRICAL CONTROLLERS

A. Controller: Built and supplied by a UL recognized and listed exhaust system manufacturer. Controller shall carry the UL - CUL listing label as an "Enclosed Industrial Control Panel." Individual components listed by UL - CUL shall not satisfy the above requirement. Manufacturer shall undergo monthly inspections by UL to verify all requirements and standards are met as outlined by UL. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications to follow.

B. Electrical Controllers: Bear a visible UL listing label as proof of subscribership and shall be validated by UL www.ul.com/database/ as an "Enclosed Industrial Control Panel". Certification documents shall accompany bid documents.

1. Manufacturer Name: _____
2. UL File No.: _____
3. Electrical controller and manufacturer shall be recognized and listed by UL. Controller shall be manufactured in accordance with Underwriters Laboratories standard UL-508 for "Enclosed Industrial Control Panels". The electrical controller shall include a Class 1 limited energy control circuit. Enclosures shall be NEMA 12 rated and UL listed as Type 12. The electrical control components shall be provided and mounted in an electrical enclosure to restrict access to internal components of the controller by authorized personnel only.

C. Controller Performance: Designed to sense the output pressure and temperature change inside the ductwork system, which is normally generated by any internal combustion engine designed to propel a motor vehicle. The operating logic shall be designed to complete this cycle. At any point in time when a collection device is connected to a motor vehicle's exhaust tailpipe, as the operator starts the vehicle, the controller shall automatically sense the engine's output pressure or temperature of the exhaust and in turn energize the electrical contactor which will supply power to the AMCA certified spark resistant fan motor. Through the use of an adjustable timer the controller shall keep the contactors energized for up to six minutes in accordance with the stations response requirement. If the responding vehicle does not disconnect from the exhaust ventilation system in less than the designated setting, the temperature override switch shall override the time delay to ensure continuous system operation. This automated function will work for as long as the exhaust gas temperature is in excess of the setting on the heat sensor located in the ductwork system. This cycle shall not allow the electrical contactor, which energizes the exhaust fan, to short cycle or stop the fan while the system is connected to an operating vehicle.

D. Motor Control Contactor: Allen Bradley Industrial Electrical Contactor 100C series. The contactor shall be UL - CUL listed as an approved component.

E. Motor Control Overload Relay: Allen Bradley 193 ES series. Overload relay shall have an adjustable trip range to meet the proper full load amperage of the blower motor.

F. Soft Touch Controls: Incorporated on the face or the access door of the controller by the use of an adhesive backed Lexan membrane type label to prevent water infiltration, which would void the NEMA 12R rating. Label: Provided and secured permanently to the exterior of the electrical controller. Label: Include the name of the manufacturer, address, telephone number, user instructions and any warnings or cautions required by Underwriters Laboratories.

1. Auto Start: This mode of operation shall be strictly for normal day to day use, as it would apply to receiving an emergency call and leaving the station. Any one or combination of the three devices listed below in Paragraph H shall activate the system. The system shall maintain itself in the Auto Start mode and always return there after the Stop sequence has

been initiated. The controller shall not have a permanent off position due to the potential health hazards of diesel exhaust components.

2. Stop: This mode of operation shall be a system override to shut down the system manually. Upon activating this mode of operation the exhaust system blower shall shut down. After a period not to exceed three seconds the controller shall automatically return to the Auto Start ready mode. This shall be a safety feature to prevent a potential health hazard from carcinogenic diesel exhaust leakage from systems having an undesirable open nozzle.
3. This mode of operation shall be a system override to run the exhaust system blower continuously for the purpose of running the vehicles indoors for equipment checks during inclement weather. Upon activating this mode of operation the exhaust system blower shall start and run continuously until the Stop mode is activated at which point the system will automatically return to the Auto Start ready mode within a maximum three second time period.

G. System Indicator LED's: Show system status at all times.

1. Auto Start Indicator: Indicate the system is in the fully automatic mode of operation and that power is on to the controller.
2. Fan on Indicator: Indicate that power is being applied to the system blower and the controller is operating normally.
3. Filter Status Indicator: Indicate if flashing, excessive pressure loss across the filter bank media. Consequently the filter must be serviced to maintain optimum efficiency of the system.
4. Stop Indicator: Indicate the fan has been manually de-energized and will return to the Auto Start ready sequence in less than three seconds to prevent the system blower from being left in the Off mode.
5. Manual Run Indicator: Indicate the fan is operating in a continuous run mode until interrupted by the stop mode activation.

H. Controller Transformer: UL listed industrial control circuit transformers sized to properly supply all components so that only one transformer shall be required. Transformer shall be provided with multi-tap primary for 115, 208, 240, 277, 400, 480, and 600VAC, and 24, 120, 230VAC secondary operating on 50 or 60 hertz with a capacity of 90 volt amperes.

I. Control Circuit Protection: By the use of primary and secondary fuses (NEC code ref. 430-72) to meet UL requirements. A pair of FLQ style fuses rated at 1.6 amps for voltages under 400V and a pair of .75 amp fuses for voltages shall protect the primary over 400V. The primary fuse holder shall have a standard indicator light feature to aid in troubleshooting blown fuses. A single glass fuse rated at 3 amps at 250V shall protect the secondary side of the control circuit.

J. Electronic Control Circuit Card: Solid state printed circuit board. The soft controls shall be an integral part of the control circuit card. The control circuit card shall utilize a potentiometer to adjust the length of the timing cycle from 7 to 360 seconds. It shall incorporate several different modes of operation and optional features.

K. Activation Devices: 1. Engine Start Switch: An engine pressure sensing type, capable of recognizing the output pressure of any type of motor vehicle exhaust. The electrical contact shall be dry type or not to exceed 24V ac. There shall be one sensor per vehicle.

2. Thermal Start Switch: Temperature sensing switch of the snap disc type and adjustable from 90 degrees F (32 degrees C) to 130 degrees F (55 degrees C) to configure the system based on different exhaust temperatures. There shall be one sensor per vehicle.
3. Remote Control Transmitter and Receiver: Shall be an optional feature with three independent channels of control. The receiver shall operate on 12V to 24 V AC or DC. The handheld transmitter shall be molded out of a highly visible orange composite with a visor clip on the back making it rugged and easy to locate. A 9-volt battery for ease of replacement and cost savings shall power it. Utilizing three sets of normally open and normally closed contacts allows the device to be used to control three separate functions from up to one quarter of a mile away.
   a. Channel A: Shall be capable of starting and stopping the exhaust system blower.
   b. Channel B: Shall be capable of operating the apparatus bay door upon entering or leaving the fire station, if desired.
   c. Channel C: Shall be capable of remotely controlling the traffic signal in front of the fire station, if so equipped.

L. Clean Filter Indicator Alarm: Used in conjunction with the optional Unifilter for filtering diesel exhaust particulate before release to the atmosphere. The clean filter indicator shall monitor the pressure loss across the filter bank media. Once the useful life of the filter has been depleted the pressure differential switch will signal a high-pressure loss and flash the "Fan On" indicator while the exhaust blower is running.
M. Remote Alarm: Shall be an optional feature to monitor the system and advise when a preset number of emergency runs on the system have accrued.
N. No Airflow Alarm: Shall be an optional feature to monitor the system and advise when the exhaust fan is not functioning properly.
O. Carbon Monoxide Alarm: Shall be an optional feature to monitor the carbon monoxide levels inside the apparatus bay area.
P. Electrical Wiring: Run in wire channel to allow for easier identification of the wiring circuits and for a neat appearance. All wiring circuitry shall meet National Electric Code and UL standards for proper size, bending radiuses (NEC code ref. 300-34) and terminations.
Q. Electrical Terminal Block: 600 V, UL rated and recognized. It shall provide individual connection points for remote controls, clean filter indicator and power connections. The primary and secondary control wiring fuses shall be incorporated into the terminal block as one unit.
R. Product Manual: Shall be provided with each electrical control box supplied. The product manual shall include a description of components with part numbers inclusive to the controller. It shall include a wiring schematic showing all internal circuitry as well as all field installed wiring connections to the controller.
S. Electrical Interference: To protect the apparatus and communications, designs that allow any possibility of electrical back-feed or induced current which may interfere with a central services communication or onboard vehicle computer logic or navigational equipment will not be accepted.

2.43 ELECTRICAL SYSTEM

A. Station Electric Supply Panel: The power circuit for the "Emergency Response Vehicle Exhaust Removal System" shall originate in a circuit breaker panel board of the appropriate size to handle the load. Fan circuit shall be supplied by a UL listed, HACR rated circuit breaker (HACR rating is specifically for motor type loads) of the same type as indicated by the manufacturer of the circuit breaker panel or a dual element time delay fuse for fuse style panels. The circuit shall be clearly marked on an engraved ledger plate or in ink on the panel schedule as "Emergency Response Vehicle Exhaust Removal System".
B. OS-3 Automatic Controller: Built and supplied by a UL recognized and listed exhaust system manufacturer. Controller shall carry the UL - CUL listing label as an "Enclosed Industrial Control Panel". Individual components listed by UL shall not satisfy the above requirement. Manufacturer must undergo monthly inspections by UL to verify all requirements and standards are met as outlined by UL. The controller shall be delivered as an Operating System Three series controller or an approved equal to the specifications in 2.17 Electrical Controllers. The controller shall be mounted 6 feet (1829 mm) to the top of the cabinet AFF (above finished floor). A safety disconnecting means must be within sight of the controller for servicing and for safety reasons. If the supply panel is not within sight, a separate disconnecting means is required beside the controller (NEC code ref. 430-102 (a). Safety disconnect shall be capable of being locked in the off and on position to follow lockout, tag out procedures. See attached Table 1-1 for proper Square D part number of safety disconnect switch.
C. Power Wiring Conduit: Minimum of EMT utilizing compression type fittings for damp locations such as apparatus wash down areas (NEC code ref. 348-10). Conduit shall be supported with a conduit strap every 10 feet and within 3 feet of each box or termination, (International Electrical Code and local modifiers.).
D. Power Wiring from Supply Panel to OS-3: THHN stranded copper wire consisting of a flame retardant, heat-resistant thermoplastic insulation with a nylon jacket for abrasion, gas, and oil resistance and rated up to 600 volts.
E. Low Voltage Control Wiring: Minimum of a 14/2 multi-conductor shielded cable (Anixter part number #2AS-1401POS or equivalent) to meet UL standards for the controller's low voltage field wiring. Termination procedure shall be as follows; the shielded cable shall be stripped back inside the control cabinet, the mylar foil shield and silver drain wire are to be twisted together and secured under the screw in the grounding lug inside the control cabinet. Terminations at each

sensor must leave foil shielding and drain wire intact and at no point shall it come into contact with ground. There shall be only one connection to ground.

F. Low Voltage Control: Encased in a minimum of ½ inch (12.7 mm) EMT from the OS-3 Controller to the attic or building steel where it shall terminate with an EMT connector with a threaded plastic bushing. Conduit: Supported with a conduit strap every 10 feet (3048 mm) and within 3 feet (914.4 mm) of each box or termination (NEC code ref.348-13). The 14/2 multi-conductor shielded cable (Anixter part number #2AS-1401POS or equivalent) shall be supported by the building structure and ran in a manner that the cable will not be damaged by normal building use (International Electrical Code and local modifiers.), securely fastening it with nylon tie wraps every 24 inches (609.6 mm) to 36 inches (914.4 mm). Draping of the cable perpendicular to building steel or support members will be unacceptable.

G. Power Wiring from OS-3 to Fan Motor: Minimum of EMT utilizing compression type fittings for damp locations such as apparatus wash down areas (NEC code ref.348-10). Conduit shall be supported with a conduit strap every 10 feet (3048 mm) and within 3 feet 914.4 mm) of each box or termination (International Electrical Code and local modifiers.). Conduit shall extend through the outside wall through a hole of the proper size and terminate directly into the back of the safety disconnect with the appropriate connector and sealed with a silicon sealer or cement mortar. (Using fan model number select appropriate wire and conduit size from Table 1-1).

H. Fan Safety Disconnect: Square D, non-fusible, NEMA 3R rated for wet locations, mounted adjacent to the AMCA Certified blower. Safety disconnect shall be capable of being locked in the off and on position to follow lockout, tag out procedures. (Using fan model number select appropriate safety disconnect from attached Table 1-1).

I. Liquid Tight Flexible Metal Conduit: UL listed liquid tight flexible metallic conduit (Sealtite). Conduit will encase the load wires and ground wires from the safety disconnect switch to the blower motor. Conduit lengths not to exceed 4 feet (1219.2 mm) from disconnect to blower motor. The appropriate listed terminal fittings shall be used. (NEC code ref.351-7) (Using fan model select appropriate conduit size from attached Table 1-1).

J. Spark Resistant Blower: AMCA certified, designed and installed as a direct drive spark resistant blower (IMC code ref. 503.2) The motor shall meet current EPACT standards for energy savings. Fans utilizing steel housings and impellers will not be accepted.

K. Temperature Switch: One for each apparatus connected to the system. The temperature switch shall be of the snap disc type and adjustable from 90 degrees F (32 degrees C) to 130 degrees F (54 degrees C). It shall be mounted on the ductwork 2 inches (50.8 mm) above the pressure switch by drilling a 1 inch (25.4 mm) hole, sealing the switch with silicon sealant and securing with 2 tek screws. Electrical connection shall be made with terminals provided or solder less type such as Thomas & Betts part no. 14RB-2577 or equivalent.

L. Pressure Switch: One for each apparatus connected to the system. The pressure switch shall operate at a maximum of 24VAC, pre-calibrated at .18 in. of water column. Mounting shall be accomplished by drilling a 3/8 inch (9.5 mm) hole 3 inches 76.2 mm) above the riser bracket and to the left of the regulator and threading the switch into the duct. The electrical connections shall be made with a 0.020 inch (.5 mm) by 0.187 inch (4.8 mm) female quick disconnect terminals, such as Thomas & Betts part no. 14RBD-18277 or equivalent.

PART 3 – EXECUTION

3.1 EXAMINATION

Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, service-utility connections, and other conditions affecting installation and performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

Provide surface/substrate preparation as required by the manufacturer's printed installation instructions. Do not proceed with installation is in proper condition to receive vehicle exhaust installation.

3.3 INSTALLATION

Install vehicle exhaust system in accord with manufacturer's written instructions, original design and referenced standards.

3.4 ADJUSTING

Adjust vehicle exhaust system for proper operation. Replace any parts that prevent the system from operating properly.

3.5 CLEANING

Remove all debris caused by installation of the vehicle exhaust system. Clean all exposed surfaces to as fabricated condition and appearance.

3.6 PROTECTION

Provide protection of the completed installation until completion of the project. Repair any damage at no additional cost to Owner.

3.7 DEMONSTRATION

Provide the end user a minimum of one hour of hands-on demonstration and operation of the vehicle exhaust system and related equipment.

3.8 WARRANTY

Provide a written warrantee for a period of one year from date of shipment for all components.

END OF SECTION

DIFFUSERS, REGISTERS, AND GRILLES Section 23 37 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

B. Related Sections include the following:

1. Division 1 Section "LEED Requirements".
2. Division 23 Section 23 33 00 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.
3. Division 23 Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for balancing diffusers, registers, and grilles.

1.3 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

1.4 SUBMITTALS

A. Product Data: For each model indicated, include the following:

1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

B. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, and grilles and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

B. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled at the end of this Section.

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels,

locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Engineer for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

3.5 DIFFUSER, REGISTER AND GRILLE SCHEDULE

A. Lay in Ceiling Diffuser:

1. Products: Subject to compliance with requirements, modular removable core, 4 core, provide one of the following:

    a. Air Systems Components; Krueger Div.
    b. Anemostat Products; Dynamics Corp. of America.
    c. Titus.
    d. Price.

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Duct Connection: Round. or Square.
5. Duct Connection Size: As shown on drawings.
6. Face Size: 24" x 24."
7. Maximum Noise-Criterion Rating: NC20.
8. Face Style: Square. Perforated.
9. Mounting: Lay in.
10. Pattern: Adjustable.
11. Dampers: Opposed blade.

B. Hard Ceiling or Duct Mount Diffusers: Is the same as lay in ceiling diffusers except:

1. Face Size: Frame size required for duct connection size.
2. Face Style: Square.
3. Mounting: Surface mount.
4. Accessories: Provide fames style to match mounting style.

C. Sidewall Supply Register:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Air Systems Components; Krueger Div.
   b. Anemostat Products; Dynamics Corp. of America.
   c. Titus.
   d. Price.

2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Adjustable vertical.
5. Rear Blade Arrangement: Adjustable horizontal.
6. Frame: 1 inch wide.
7. Mounting: Concealed.
8. Damper Type: Adjustable opposed-blade assembly.
9. Accessories: Provide frame style to match mounting surface.

D. Sidewall/Hard Ceiling: Return or Exhaust register is the same as sidewall supply register except square or rectangular face style and fixed horizontal single face blade.

E. Layin ceiling return or exhaust register is same as lay in ceiling diffuser except without adjustable pattern and removable core.

END OF SECTION

SPLIT-SYSTEM AIR-CONDITIONERS Section 23 81 26

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes split-system air-conditioning units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

B. Related Sections include the following:

1. Division 1 Section "LEED Requirements".
2. Division 01 Section 01 91 00 "General Commissioning Requirements."
3. Division 23 Section 23 09 80 "Mechanical Commissioning."

1.3 SUBMITTALS

A. Product Data: Include rated capacities, 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. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

F. 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. Refer to Division 1 Section "Product Requirements."

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. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

E. Units shall be designed to operate with HCFC-free refrigerants.

1.5 COORDINATION

A. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion on compressors and coils, and one year on parts.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of filters for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Air Conditioning; Div. of Carrier Corporation.
2. Trane Company (The); Unitary Products Group.
3. York International Corp.
4. Daikin

2.2 EXPOSED EVAPORATOR-FAN COMPONENTS

A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

1. Insulation: Faced, glass-fiber duct liner.
2. Drain Pans: Galvanized steel, with connection for drain; insulated.
3. Ductless unit with finished enclosure exposed in room, adjustable deflection supply grille, return grille and wall mount or suspended support brackets.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

D. Fan Motors: Comply with requirements in 23 Section 23 05 13 "Common Motor Requirements for HVAC Equipment."

1. Special Motor Features: Multi-tapped, variable speed with internal thermal protection and permanent lubrication.

E. Disposable Filters: 1 inch thick, in fiberboard frames.

F. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.3 Concealed Evaporator-Fan Components:

A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

B. Insulation: Faced, glass-fiber duct liner.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.

D. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

E. Fan Motors:
1. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
2. Multitapped, multispeed with internal thermal protection and permanent lubrication.
3. Three-phase, permanently lubricated, ball-bearing motors with built-in thermal-overload protection.
4. Wiring Terminations: Connect motor to chassis wiring with plug connection.

F. ASHRAE compliance in "Airstream Surfaces" Subparagraph below may be required to comply with Project requirements or authorities having jurisdiction. Retain first subparagraph to comply with LEED Prerequisite IEQ 1.

G. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

H. Filters: Permanent, cleanable.

I. Condensate Drain Pans: Provide factory supplied drainable condensate drain pan with connection at lowest point of pan.

2.4 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

1. Compressor Type: Reciprocating.
2. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
3. Refrigerant Charge: R-410a or 407c.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Fan: Aluminum-propeller type, directly connected to motor.

E. Motor: Permanently lubricated, with integral thermal-overload protection.

F. Low Ambient Kit: Permits operation down to 45 deg F.

2.5 ACCESSORIES

A. Control equipment and sequence of operation are specified in Division 23 Sections 23 09 00 "Instrumentation and Control for HVAC" and 23 09 93 "Sequence of Operations for HVAC Controls."

B. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounting compressor-condenser components on equipment supports specified in Division 7 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Install seismic restraints.

E. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. Refer to Division 23 Section 23 05 48 "Vibration and Seismic Controls for HVAC Piping and Equipment."

F. 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.

B. Install piping adjacent to unit to allow service and maintenance.

C. Ground equipment according to Division 26.

D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1 Section 01 77 00 "Closeout Procedures."

END OF SECTION

VARIABLE REFRIGERANT AIR CONDITIONING SYSTEM — Section 23 81 27

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes variable refrigerant air-conditioning units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, 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. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For variable refrigerant air-conditioning units to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.4 RELATED DOCUMENTS

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

1.5 SUMMARY

A. This Section includes split-system air-conditioning units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

B. Related Sections include the following:

1. Division 1 Section "LEED Requirements".
2. Division 01 Section 01 91 00 "General Commissioning Requirements."
3. Division 23 Section 23 09 80 "Mechanical Commissioning."
4. Division 23 Section 23 09 00 "HVAC Instrumentation and Controls."

1.6 SUBMITTALS

A. Product Data: Include rated capacities, 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. LEED Submittals: Provide cost data breakdown, recycle content and manufacturer name and location.

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.7 SYSTEM DESCRIPTION

A. The variable capacity, heat pump or heat recovery air conditioning system shall consist of multiple evaporators, a refrigeration distribution system using PID controls, branch selector boxes, and outdoor units. The outdoor unit shall be a direct expansion (DX), air-cooled heat pump or heat-recovery (as indicated on the plans), multi-zone air-conditioning system with variable speed driven compressors using R-410A refrigerant. All zones shall be capable of operating separately with individual temperature controls.

B. Operation of the system shall permit either cooling or heating of all of the fan coil units. Each fan coil or group of fan coils shall be able to provide set temperature independently via a local remote controller, an Intelligent Controller, an Intelligent Manager or a BMS interface as specified.

1.8 REQUIRED FEATURES

A. Autocharging – Each system shall have a refrigerant auto-charging function.

B. Charge Checking – Each system shall have a refrigerant charge checking function.

C. Defrost Heating – Each system shall maintain continuous heating during defrost operation.

D. Independent Control – Each fan coil shall use a dedicated electronic expansion valve for independent control.

E. VFD Inverter Control – Each condensing unit shall use a high efficiency, variable speed "inverter" compressor coupled with inverter fan motors for superior part load performance.

F. Compressor capacity shall be modulated automatically to maintain a constant suction pressure, while varying the refrigerant volume for the needs of the cooling or heating loads.

G. Indoor fan coil units shall use PID control to control superheat and maintain the temperature setpoint within +/- 1°F.

H. Condensing units shall be provided with a fan/fan motor ESP up to 0.32" WG as standard to allow connection of discharge ductwork and to prevent discharge air short circuiting.

I. Advanced Diagnostics – Systems shall include a self diagnostic, auto-check function to detect a malfunction and display the type and location.

1.9 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. The units shall be listed by Electrical Laboratories (ETL) and bear the cETL label.

C. All wiring shall be in accordance with the National Electric Code (NEC).

D. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.

E. The outdoor unit will be factory charged with R410A.

1.10 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled according to the manufacturer's recommendations.

1.11 WARRANTY

A. General: The units shall have a manufacturer's warranty for a period of one (1) year from date of installation. The units shall have a limited labor warranty for a period of one (1) year from date of installation. The compressors shall have a warranty of six (6) years from date of installation. All warranty service work shall be performed by factory trained service professionals.

B. Installation Requirements: The system must be installed by a factory trained contractor. The bidders shall be required to submit training certification proof with bid documents. The mechanical contractor's installation price shall be based on the systems installation requirements. The mechanical contractor bids with complete knowledge of the HVAC system requirements.

1.12 PERFORMANCE

A. DESIGN BASIS: The HVAC equipment basis of design is Daikin AC. Alternate manufacturers would be Mitsubishi and Sanyo. The system is a heat recovery variable refrigerant volume system allowing simultaneous heating and cooling. Other manufacturers that quote this project shall furnish the minimum system standards as defined by the base bid model numbers, model families or as otherwise specified herein (see General Specifications and Alternate Supplier Checklist in particular). In any event, the contractor shall be responsible for all specified items and intents of this document without further compensation. Contractor shall be financially responsible for all costs associated with the substitution, including, but not limited to review, re-engineering, work of other trades, etc.

PART 2 – PRODUCTS

2.1 OUTDOOR UNIT

A. General:

1. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
2. High/low pressure gas line, liquid and suction lines must be individually insulated between the outdoor and indoor units.
3. The sound pressure level shall be 63 dBA or less at 3 feet from the front of the unit.
4. The system will automatically restart operation after a power failure and will retain all settings, eliminating the need for reprogramming.
5. The unit shall incorporate an auto-charging feature and a refrigerant charge check function.
6. The following safety devices shall be included on the condensing unit; high pressure switch, control circuit fuses, crankcase heaters, fusible plug, high pressure switch, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
7. To ensure the liquid refrigerant does not flash when supplying to the various fan coil units, the circuit shall be provided with a sub-cooling feature.
8. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.
9. The outdoor unit shall be capable of heating operation at 0°F dry bulb ambient temperature without additional low ambient controls.
10. The system shall continue to provide heat to the indoor units while in the defrost mode. Alternately, the contractor must provide electric strip heat with controls for each of the fan coil units which energizes during this mode.

11. The system shall continue to provide heat or cooling during change-over of any of the branch selctor boxes. Alternately, the contractor must provide electric strip heat with controls for each of the fan coil units which energizes during this mode.

B. Unit Cabinet:

1. The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

C. Fan:

1. The condensing unit shall consist of one or more propeller type, direct-drive fans that have variable speed operation via a DC (digitally commutating) inverter.
2. The condensing unit fan shall have 0.32" of external static pressure available.
3. Nominal sound pressure levels shall be 63 dBA or less.
4. The fan motor shall have inherent thermal overload protection and permanently lubricated bearings.

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins shall be covered with an anti-corrosion acrylic resin and type E1, hydrophilic film.
5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.

E. Compressor:

1. The scroll compressors shall be variable speed PAM inverter to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency or STD ON/OFF) shall be controlled to eliminate deviation from target value.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G-type".
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be from 100% to as low as 6%.
5. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
8. The compressor shall be spring mounted to avoid the transmission of vibration.

9. Units sized 8-12 ton shall contain a minimum of 2 compressors, units larger than 12 tons shall contain a minimum of 4 compressors. In the event of compressor failure the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of a Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours.

F. Electrical:

1. The power supply to the outdoor unit shall be as shown on the equipment schedule.
2. The control voltage between the indoor and outdoor unit shall be 16VDC non-shielded, stranded 2 conductor cable.
3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one outdoor unit with one 2-cable wire, thus simplifying the wiring operation.

2.2 INDOOR UNITS: CONCEALED CEILING DUCTED

A. General:

1. Indoor, built-in, ceiling concealed, fan coil units, operable with R-410A refrigerant, shall be equipped with an electronic expansion valve, for installation into the ceiling cavity. The unit shall be constructed of a galvanized steel casing. Computerized PID control shall be used to maintain room temperature within 1°F.

B. Indoor Unit:

1. The indoor unit shall be completely factory assembled and tested. It shall be provided complete with factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an adjustable external static pressure switch.

2. Indoor units shall be above ceiling ducted, wall mount cassette type, ceiling mount cassette type, or below ceiling, horizontal cassette type as scheduled on the plans.
3. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
4. Both refrigerant lines shall be insulated from the outdoor unit.
5. The indoor units shall be equipped with a return air thermistor.
6. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
7. The voltage range will be 253 volts maximum and 187 volts minimum.
8. Switch box shall be reached from the side or bottom for ease of service and maintenance.
9. Fan coil units shall be equiped with factory mounted condensate pumps.

C. Unit Cabinet:

1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:

1. The fan shall be a direct-drive Sirocco type fan with statically and dynamically balanced impeller and high and low fan speeds available.
2. The airflow rate shall be available in high and low settings.
3. The fan motor shall be thermally protected.
4. Ducted fan coils 4 tons and smaller shalled be equiped with DC (ECM) motors with auto CFM adjustment at commissioning. This feature shall adjust the airflow based on the external static pressure.

E. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. A condensate pan shall be located under the coil.
4. A thermistor shall be located on the liquid and gas line.

F. Condensate Pumps:

1. The units shall be provided with condensate pumps as required. Condensate pumps shall be powered from the associated fan coil unit.

2.3 DDC Controls

1. The Variable Refrigerant Volume system shall be supplied with factory mounted DDC controllers on each fan coil unit and on the condensing units. The controls shall communicate seamlessly to provide precise temperature control and minimize energy consumption.

2. An I-touch, touchscreen, Building Automation System shall be provided. This shall communicate directly with the condensing units, fan coils, and other ancillary equipment.

3. Advanced Remote Controller

The Advanced Remote Controller shall be capable of controlling a group of up to 16 indoor units. The Advanced Remote Controller shall only be combined in the same group with another Advanced Remote Controller with up to two remote controllers per group.

The Advanced Remote Controller shall connect using two-wire, stranded, non-shielded, non-polar control wire to the indoor unit and shall require no addressing.

The Advanced Remote Controller shall be approximately 4.75" x 4.75" in size with a backlit 2.75" x 1.75" LCD display. Display information shall be selectable from English, French, or Spanish. Day of the week as well as time of day configurable for 12/24 hour clock shall be displayed. Display of temperature information shall be configurable for Fahrenheit or Celsius.

The controller shall be able to display room temperature in one degree increments with a range of 0 - 176°F / 0-80°C.

The Advanced Remote Controller shall control the following grouped operations: On/Off, Operation Mode (Cool, Heat, Fan, Dry and Auto), independent Cooling and Heating setpoints in the Occupied mode and independent Cooling Setup and Heating Setback setpoints in the Unoccupied mode, fan speed, and airflow direction and have the ability to individually prohibit controller buttons. The controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating in the occupied period.

The Advanced Remote Controller shall support schedule settings with selectable weekly pattern options of 7-day, Weekday + Weekend, or Weekday + Saturday + Sunday. The schedule shall support unit On/Off with independently settable Cooling and/or Heating setpoints when unit is on (occupied), or Setup and/or Setback setpoints when unit is off (unoccupied). A minimum of 5 operations shall be schedulable per day in 1-minute increments.

The Advanced Remote Controller shall support auto-changeover mode for both heat pump and heat recovery systems allowing the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat according to the room temperature and temperature setpoint. Changeover to cooling mode shall occur at cooling setpoint + 1°F (0.5°C). Changeover to heating mode shall occur at heating setpoint - 1°F (0.5°C).

The Advanced Remote Controller shall support an Auto Off timer for temporarily enabling indoor unit operation during the unoccupied period. When the Off Timer is enabled and after the unit is manually turned on at the remote controller, the controller shall shut off the unit after a set time period. This period shall be configurable in the controller menu with a range of 30-180 minutes.

The room temperature shall be sensed at either the Advanced Remote Controller or the Indoor Unit return air temperature sensor (or remote mount sensor) dependent on the Field Setting configured through the remote controller.

The Advanced Remote Controller shall display an error code in the event of system abnormality/error. The controller shall also display the following system temperatures to assist service personnel in troubleshooting: Return Air Temperature, Liquid Line Temperature, Gas Line Temperature, Discharge Air Temperature (depending on unit), Remote Controller Sensor Temperature, and Temperature used for Indoor Unit Control.

The Advanced Remote Controller shall support the functions listed below.

Advanced Remote Controller	
Item	Description
LCD Display	Backlit with auto-off after 30 seconds. Contrast adjustment. Capable of two display modes: Standard, which displays Mode, Setpoints, and Fan Speed in large font as well as system status icons, and Detailed which adds Room Temperature (0-176°F/0-80°C range in 1° increment), Airflow Direction, Date and Time.
Menus	The following menus shall be available: Main for basic user operation, Service for installation and commissioning, and Maintenance for troubleshooting.
On/Off	Run and stop operation for an indoor unit or group of indoor units.

Advanced Remote Controller	
Item	Description
Mode	Switches between Cool/Heat/Fan/Dry/Auto.
Occupied Cool/Heat Setpoints	Range: 60-90°F (16-32°C) in 1° increment.
Unoccupied Setup/Setback Setpoints	Range: 40-95°F (5-35°C) in 1° increment.
Fan Speed	Up to 3-speed depending on type of indoor unit.
Air Flow Direction	Air flow direction angles 100%-80%-60%-40%, Swing, depending on indoor unit model.
Weekly Schedule	Patterns: 7-Day, Weekday + Weekend, Weekday + Saturday + Sunday Up to 5 On/Off operations per day with the ability to set new individual Occupied Cooling and/or Heating setpoints or Unoccupied Setup and/or Setback setpoints per operation

2.4 HVAC EQUIPMENT ALTERNATE (GENERAL INFORMATION)

A. Alternate equipment supplier shall provide to the bidding mechanical contractor a complete equipment data package. This package shall include, but is not limited to, equipment capacities at the design condition, power requirements, indoor units CFM/static pressures, fan curves, installation requirements, and physical dimensions. Nominal performance data is not acceptable.

1. The mechanical contractor shall request and receive the equipment data package 15 days prior to bid date and submit this package with the alternate bid.

2. The mechanical contractor shall list the equipment supplier and submit the required data package with the bid detailing a complete comparison of the proposed alternate equipment to the specified equipment and the associated cost reduction of the alternate equipment. The contractor bids an alternate manufacturer with full knowledge that that manufactures product may not be acceptable or approved.

B. Alternate equipment supplier shall furnish a complete drawing package to the mechanical contractor 15 days prior to bid day. Alternate equipment supplier shall prepare the following drawings:

XXX HVAC Floor Plan
XXX HVAC Refrigerant Piping Plan
XXX HVAC Refrigerant Piping/Controls Details
XXX HVAC Details
XXX HVAC Schedules

1. The alternate equipment supplier shall draft all piping circuits, components, overall building control schematic, detailed control wiring diagrams, system details and schedules for their system. The drawings shall convey all requirements to successfully install the alternate equipment suppliers system.
2. Provide (1) drawing package in electronic format (.dxf files) on CD.
3. The submitted documents shall be complete system designs and show no less information than the HVAC equipment/controls contract bid documents.

C. The equipment supplier shall submit as part of the equipment data package outdoor unit data sheets. Data sheets to include the following at minimum:

Capacities: Cooling
Cooling (Btu/h)

Cooling Input Power
(kW)

Capacities: Heating
Heating (Btu/h)

Heating Input Power
(kW)

Operating Temperature Range:
Cooling
Heating

Power Supply:
Maximum Circuit Amps (MCA)
Maximum Fuse Amps (MFA)
Maximum Starting Current (MSC)
Total Over Current Amps (TOCA)
Outdoor Fan Motor

Refrigerant:
Refrigerant Type/Charge
Control

Unit Data:
Max. Number of Indoor Units
Sound Pressure Level at 3ft. (dBA)
Weight (lbs)
Dimensions

D. Alternate equipment supplier shall submit with bid, indoor unit data sheets. Data sheets to include the following at minimum:

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounting compressor-condenser components on equipment supports. Anchor units to supports with removable, cadmium-plated fasteners.

D. Install seismic restraints.

E. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. Refer to Division 23 Section 23 05 48 "Vibration and Seismic Controls for HVAC Piping and Equipment."

F. 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.

B. Install piping adjacent to unit to allow service and maintenance.

C. Ground equipment according to Division 26.

D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

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.
4. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1 Section 01 77 00 "Closeout Procedures."

* End Division 23 *

Division 24 - UNASSIGNED

NOT USED

* End Division 24 *

Division 25 - INTEGRATED AUTOMATION

NOT USED

* End Division 25 *

Division 26 – ELECTRICAL

BASIC ELECTRICAL REQUIREMENTS SECTION 26 05 00

PART 1 - GENERAL

1.1 WORK INCLUDED

A Work included in this Section: All materials, labor, equipment, services, and incidentals necessary to install the Electrical Work as shown on the drawings for both Fire Station Number 5 and Temporary Fire Station Number 5, and as specified hereinafter, including, but not limited to the following:

1 New electrical services, including:
   a Underground primary conduits from the utility point of connection to a new utility pad mount transformer, and associated grounding (for utility transformers).
   b Secondary service from the new transformer.
   c Temporary fire station electrical service as indicated on the drawings.
   d New Fire Station power distribution system to consist of the main switchboard, stand by emergency generator, automatic transfer switch, and branch panelboards. Work to include all feeders, branch circuit wiring, wiring devices and connections to all equipment requiring electrical service.
2 Underground Telephone service raceways from the utility point of connection for Fire Station Number 5 and Temporary Fire Station Number 5.
3 Underground Cable Television service raceways from the utility point of connection for Fire Station Number 5 and Temporary Fire Station Number 5.
4 Lighting branch circuit wiring, wiring devices, switches, and connections to all lighting equipment on the project (interior and exterior).
5 Interior and exterior lighting fixtures completely lamped.
6 Emergency egress/exit illumination system.
7 Cable Television System outlet boxes and conduit as indicated on the drawings.
8 Fire Alarm system.
9 Mechanical equipment power connections, including starters (where required), fuses, disconnect switches, and motor rated switches where noted.
10 Lighting control system.
11 Transient voltage suppression system.
12 Emergency Generators.
13 Automatic transfer switches.
14 Telephone/Data System, outlet boxes and conduit as indicated on the drawings.
15 Fire Station Alerting System provisions as indicate on the drawings. Refer to electrical drawings for scope of electrical work.
16 Radio/Public Address/Intercom speaker system. Refer to electrical drawings for scope of electrical work.
17 Antenna conduit provisions.
18 Photovoltaic System.
19 Miscellaneous electrical provisions for overhead doors, hose dryers, etc.
20 All required incidental work, such as roof flashing, testing, and temporary power.
21 Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
22 It is the intent of the drawings and specifications that systems be complete and, except as otherwise noted, be ready for operation.

1.2 RELATED WORK

A General Requirements

B Finishes
C Mechanical
D Firestopping

1.3 INCORPORATED DOCUMENTS

A Requirements of the General Conditions, Supplementary Conditions, and Division 1 Sections apply to all work in this Section, unless modified herein.

B Published specifications, standard tests or recommended methods of trade, industry or government organizations apply to work of this Section where cited by abbreviations noted below, unless modified herein.

1. 2010 California Code of Regulations, latest adopted edition.
2. 2010 California Building Standards Administrative Code, Part 1, Title 24, C.C.R. latest adopted edition.
3. 2010 California Building Code or latest adopted version (CBC), based on International Building Code 2009 or latest adopted version (IBC) with California Amendments.
4. 2010 California Electrical Code (CEC), Part 3, Title 24, C.C.R. (Based on 2008 National Electrical Code with California Amendments) latest adopted edition.
5. 2010 California Mechanical Code (CMC), Part 4, Title 24, C.C.R. (Based on 2009 Uniform Mechanical Code with California Amendments) latest adopted edition.
6. 2010 California Plumbing Code (CPC), Part 5, Title 24, C.C.R. (Based on 2009 Uniform Plumbing Code with 2007 California Amendments) latest adopted edition.
7. California Energy Code, Part 6, Title 24, C.C.R. latest adopted edition.
8. 2010 California Fire Code (CFC), Part 9, Title 24, C.C.R. (Based on 2009 International Fire Code with California Amendments) latest adopted edition.
9. American Society of Civil Engineers 7-05 (ASCE/SEI), Minimum Design Loads for Buildings and Other Structures.
10. Underwriters' Laboratories, Inc. (UL).
11. Local Utility Company regulations.

C All State and Municipal Codes and Ordinances.

1.4 CONDITIONS AT SITE:

A Visit to site is required of all bidders prior to submission of bid. All will be held to have familiarized themselves with all discernible conditions and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.

B Lines of other services that are damaged as a result of this work shall promptly be repaired at no expense to the Owner to the complete satisfaction of the Owner.

1.5 QUALITY ASSURANCE

A Conformance:

1 All work shall conform to the applicable requirements of Article 1.3 above.
2 The Contractor shall notify the Architect, prior to submission of bid, about any part of the design, which fails to comply with abovementioned requirements.
3 If after contract is awarded, minor changes and additions are required by aforementioned authorities, even though such work is not shown on drawings or covered in the specifications, they shall be included at Contractor's expense.

B Coordination:

1 The Contractor shall become familiar with the conditions at the job site, and with the drawings and specifications and plan the installation of the electrical work to conform with the existing conditions and that shown and specified so as to provide the best possible assembly of the combined work of all trades.
2 The Contractor shall work out in advance all "tight" conditions, involving all trades and if found necessary, supplementary drawings shall be prepared by this Contractor, for the Architect's approval, before work proceeds in these areas. No additional costs will be considered for work, which must be relocated due to conflicts with the work of other trades.
3 The Contractor shall coordinate and verify all backbox, device, lighting fixture, or equipment mounting requirements with the devices or equipment to be installed, prior to rough in.

1.6 SUBMITTALS

A Product Data:

1 Comply with the provisions of Section 01 33 10 – Submittals.

2 Within 15 days after award of the Contract, submit:

a Complete material list of all items proposed to be furnished and installed under this Section, including but not limited to the following items: Circuit breakers, lighting fixtures, conduit, devices, enclosures, etc.

b Manufacturers' specifications and other data required demonstrating compliance with the specified requirements.

c Manufacturers' recommended installation procedures which, when approved by the Architect, shall become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

3 Shop Drawings: Furnish shop drawings and/or equipment cuts for the following:

a Light fixtures including lamps and ballasts

b Main Switchboard, Temporary Fire Station Number Five Service equipment and panel boards. Panel board submittals shall include diagrams of the circuit breaker arrangements in the panels. Arrange circuit breakers in panels exactly as shown on the panel schedules in the construction documents.

c Fire alarm system

d Emergency Generators

e Disconnect switches

f Motor starters

g Automatic Transfer Switches

h Lighting control system

i Transient voltage suppression system

j Power and signal concealed service floor boxes

k Other equipment where noted in other Sections.

l Mechanical and Plumbing equipment. The Electrical Contractor shall review the Mechanical and Plumbing Submittals, and verify the voltage, wire size and overcurrent protection required. Also provide the Electrical Engineer with a copy of the submittals for their review.

4 Test Reports:

a Factory Tests: As specified for specific equipment.

b Field Tests: Performance tests as specified for specific equipment.

c Megger Tests: As specified under 26 08 00 - TESTING.

d Special Seismic Certification documentation as per CBC and ASCE/SEI requirements for all equipment defined as 'critical' with an importance factor of 1.5, as per Paragraph 1.10 of this Section.

5 Maintenance and Operating Manuals:

a Systems Description: Description of operating procedures.

b Controls: Diagrams and description of operation of each system.

c Equipment: Manufacturer's brochures, ratings, certified shop drawings, maintenance data, and parts lists with part numbers. Mark each sheet with equipment identification number and actual installed condition.

d Materials and Accessories: Manufacturer's brochures, parts list with part numbers, and maintenance data where applicable. Mark each sheet with identification number of system and location of installation.

e The Maintenance and Operation Manual shall be presented in a three ring binder that has tabbed sections.

6 Record Documents:

a "As-builts": As specified under Paragraph 3.2 of this Section.

1.7 DELIVERY, STORAGE AND HANDLING

A Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all trades.

B Delivery and Storage: Deliver all materials to the job site in their original containers with all labels intact and legible at time of use. Store in strict accordance with approved manufacturers' recommendations.

C Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

D This Contractor shall personally, or through an authorized representative, check all materials upon receipt at jobsite for conformance with approved shop drawings and/or plans and specifications.

1.8 SCHEDULING/SEQUENCING

A Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet the construction schedule, together with any special handling charges, shall be borne by this Contractor.

B The Contractor shall coordinate production and delivery schedule for all Owner-supplied equipment with the equipment suppliers to ensure that all Owner-supplied equipment is delivered to site in coordination with the construction schedule and in such a manner as to cause no delays in completion of the Contract as scheduled.

1.9 REQUIREMENTS

A The contract drawings indicate the extent and general arrangements of the conduit wiring systems, etc. If any departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable, and within thirty-five (35) days after award of the electrical contract.

B Unless material list and data is received as a complete and all inclusive submittal within the stipulated time all items shall be provided as specified -- with no deviations permitted.

C Any and all additional costs incurred by the substitution of electrical material or equipment, or installation thereof, whether architectural, structural, plumbing, mechanical or electrical, shall be borne by the Contractor under this Section.

D Burden of proof of equality of any substitution for a specified product is the responsibility of this Contractor.

E Where required by Architect to ascertain equality of substitute product, Contractor may be requested to provide the specified item and the submitted substitution for comparison, at no additional cost to the Owner.

1.10 SEISMIC CERTIFICATION OF EQUIPMENT AND INSTALLATION

A. See Architectural and Structural Drawings and Specifications for description of Occupancy Group and Seismic Design Category applicable to this project.

B. Provide Special Seismic Certification per CBC Section 1708 and ASCE/SEI 7-05 for all critical equipment and components. See Paragraph 1.10.M.3 of this Section for list of equipment designated as critical equipment with an importance factor of 1.5.

C. Critical equipment shall be considered a component of the structure and shall "remain online and functional" for continuous operation of the facility after a seismic event.

D. Comply with component seismic design and anchorage requirements of CBC Section 1613 for all other equipment.

E. Provide seismic restraints per applicable code and as specified or indicated. Design restraints to prevent permanent displacement in any direction caused by lateral motion, overturning, or uplift.

F. Rigidly Supported Equipment, Conduits, and Raceways.

G. Lighting:

1. Fasten lighting fixtures in suspended ceilings to ceiling grid system or otherwise support from the structures as specified herein and as per details indicated on the Drawings. Comply with National Electric Code (NEC) Article 410-16.
2. Suspension systems for light fixtures shall allow fixtures to swing a minimum of 45 degrees from the vertical in all directions without contacting obstructions.
3. Free-swinging suspension systems shall have a safety wire or cable attached to the fixture and structure at each support. The wire shall be capable of supporting four times the weight of the lights.
4. Point-source fixtures: provide slack wires to structure at two diagonal corners.
5. Troffer fixtures: provide hold-down clip at each fixture corner, and slack wires to structure at two diagonal corners.
6. Supports for pendants: Provide diagonal seismic wire restraints per Code.

H. Components supported by chains or simply suspended from above are not required to meet lateral seismic force requirements and seismic relative displacement requirements provided that they cannot be damaged or cannot damage any other component when subject to seismic motion. They must have ductile or articulating connections to the structure at the point of attachment.

I. Electrical Cabinets:
   1. Electrical cabinet design shall conform to National Electrical Manufacturers Association (NEMA) 250 and NEMA ICS6 standards. Cutouts in the lower shear panel that do not appear to have been made by the manufacturer and significantly reduce the strength of the cabinet are not permitted unless analysis demonstrates that the remaining strength is sufficient.
   2. Single freestanding cabinets shall have a minimum of four anchor bolts designed and specified with one anchor located at each corner.
   3. Multiple sections of cabinets or enclosures located adjacent to each other shall be bolted together. Minimum acceptable bolting is three bolts in the front and back along the adjacent vertical faces – 6 bolts total.
   4. Multiple cabinets bolted together to form a section or line-up shall have at a minimum two anchors specified for each cabinet, one at the front and one at the rear.
   5. Base anchorage shall be installed through anchor points designated by the Manufacturer. The largest bolt diameter for the anchor hole provided in the equipment shall be provided.
   6. A latch or fastener to prevent opening during an earthquake event and damaging the cabinet and internal components shall secure all doors.
   7. Slide-out components in electrical control panels, etc., shall have a latching mechanism to hold contents in place.
   8. Attached cabling shall have adequate slack or flexibility between the cabinets and surrounding structure supporting the conduit to preclude severing of the cabling due to differential seismic displacements.

J. The design load shall include the effects of loading on the equipment imposed by attached utility or service lines that are also attached to separate structures.

K. The attachment of additional external items is not permitted unless such items have either been provided by the Manufacturer, or analysis shows that their effects are supported by design.

L. Conduit and their connections shall be constructed of ductile materials unless otherwise approved by the Architect. Conduits and their connections constructed of non-ductile materials (e.g., cast iron, no-hub pipe and plastic) shall have brace lengths reduced to one-half that allowed for ductile material.
   1. All trapeze assemblies supporting conduit shall be braced to resist CBC design forces considering the total weight of the elements on the trapeze.
   2. Seismic restraint spacing shall be in accordance with hanger spacing.

M. Critical Equipment:
   1. Design with importance factor of 1.5.
   2. Provide Special Seismic Certification for all equipment and components and their installation per CBC and ASCE/SEI requirements.
   3. Critical Equipment shall include the following:
      a. All emergency distribution panels and panelboards on emergency power.
      b. Fire Alarm related enclosures.
      c. Emergency Generators.
      d. Automatic Transfer Switches.
      e. Lighting Control panels and cabinets.
      f. Telecom Racks and Cabinets.

N. Seismic Design Submittals: For all Critical Equipment included in paragraph 26 05 00.1.10.M.3.
   1. The Manufacturer of each item of critical equipment shall arrange for the testing or analysis by an approved agency of each component and assembly and its mounting system or anchorage.

2. The Manufacturer shall submit a Certificate of Compliance for each item for approval by the Architect and by the Authority Having Jurisdiction.
3. Based on Manufacturer's approved submittal, Contractor shall retain the services of a State of California registered Structural Engineer to prepare final installation details and drawings for equipment supports and attachments stamped by.
4. Submit drawings of the equipment showing dimensions, support equipment, connections, and the proper anchorage locations.
   a. Equipment weight and weight distribution (e.g., center of gravity in elevation and plan).
   b. Thickness of sheet metal bases.
   c. Seismic Vibration Isolation Devices: Manufacturer's product information indicating class and type. Indicate load ratings as published manufacturer's data or shop drawings. Indicate proper orientation of devices on plan.
   d. Inertia bases and support frames.
   e. Specific details of restraints including anchor bolts and welds and maximum load at each location.

1.11 GUARANTEE

A This Contractor shall guarantee that all work executed under this Section will be free from defects of materials and workmanship for a period of one (1) year or as per the General Conditions of this project, whichever is longer. Dates shall be from the date of final acceptance of the building. The contractor shall further guarantee that he will, at his own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the guarantee. Such repair or replacement shall be guaranteed for one (1) year from the date of repair or replacement.

1.12 PERMITS AND INSPECTIONS

A This Contractor shall obtain and pay for all required permits and arrange for all inspections required.

B Do not allow or cause any of the work to be covered or enclosed until it has been tested and/or inspected.

1.13 IDENTIFICATION

A Switchboards, feeder circuit breakers in switchboards, panels, disconnect switches, motor starters and motor disconnect switches, cabinets, and other apparatus used for the operation of, or control of circuits, appliances or equipment, shall be properly identified by means of engraved laminated plastic descriptive nameplates mounted on apparatus using stainless steel screws. Nameplates shall have white letters with black background and be submitted to the Architect for approval. Cardholders in any form are not acceptable.

B Each branch circuit of panel boards to have a permanently fixed number with load directory, mounted under celluloid on inside of cabinet door, showing circuit numbers and typewritten description of equipment supplied by breakers.

C Provide label on all motors: "Caution. Automatic equipment. May start at any time."

D Provide silk-screened or engraved identification labels on all switch box covers identifying specific loads that are not readily apparent to the user, including electroshades, projection screens, exhaust fans, etc.. Submit proposed labels to Architect for approval prior to manufacture of labels.

E Provide identification of all pull boxes, junction boxes, and conduit stub-ups on the project as outlined below:

1 For Power Feeders:
   a Stencil cover with identifying circuit number.
   b Lettering 1" high.
   c Color of lettering black.
   d Place lettering on cover in neat manner; run parallel to long sides of box.

2 For branch circuits, grounding, communication, signal, and control systems boxes and blank conduit stub-outs:
   a Paint inside back of each j-box, front of each cover, and ends of each blank conduit stub-out with identifying system color as listed below:

System	Color

120/208 volt	Blue
Telephone/Data	Grey
Ground system	Green
Fire Alarm	Red
Radio/PA/Intercom/Alerting System	Yellow
Security	White
Lighting control	Orange/White

PART 2 - PRODUCTS

2.1 GENERAL

A Refer to applicable Division 26 and 28 Sections for complete products specifications.

2.2 MATERIALS

A Materials of the same type or classification, used for the same purpose, shall be the product of the same manufacturer.

2.3 ACCEPTABLE MANUFACTURERS

A Materials shall be of make mentioned elsewhere in this specification. All materials shall be the best of their several kinds, perfectly new and approved by the Underwriters' Laboratories.

B Where material, equipment, apparatus or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish standards of desired quality, style and utility and shall be the basis of the bid. Materials so specified shall be furnished under the contract unless changed by written approval of the Architect. Where two or more designations are listed, choice shall be optional with this Contractor, but this Contractor must submit his choice for final approval.

2.4 POSTED OPERATING INSTRUCTIONS

A Furnish approved operating instructions for systems and equipment where indicated in the technical sections for use by operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment including startup, proper adjustment, operating, lubrication, shutdown, safety precautions, procedure in the event of equipment failure, and other items of instruction as recommended by the manufacturer of each system or equipment. Provide weather-resistant materials or weatherproof enclosures for operating instruction exposed to the weather. Operating instruction shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

2.5 CATALOGED PRODUCTS/SERVICE AVAILABILITY

A Materials and equipment shall be current products by manufacturers regularly engaged in the production of such products. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The 2-year period shall be satisfactorily completed by a product for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished. The equipment items shall be supported by service organizations which are reasonable convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

PART 3 - EXECUTION

3.1 INSPECTION

A Examine the areas and conditions under which the work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A Drawings:

1 The general arrangement and location of wiring and equipment is shown on the electrical drawings and shall be installed in accordance therewith, except for minor changes required by conflict with the work of other trades.

2 The Contractor shall coordinate and verify all backbox, device, lighting fixture, or equipment mounting requirements with the devices or equipment to be installed, prior to rough in.

3 Drawings indicate the circuit and panel, which supplies each device or fixture. Provide and install conduit and conductors to make all connections from panel to nearest device and from first device to additional devices on same circuit. Conduit size and fill shall satisfy NEC requirements. Each branch circuit to have a dedicated neutral conductor. Do not exceed 4 #12 or 3 #10 conductors in a ½" conduit, 7 #12 or 5 #10 in a 3/4" conduit, and 11 #12 or 9 #10 in a 1" conduit, unless otherwise noted. If more than three current carrying conductors are installed in one conduit, conductor size shall be increased as required per Note 8 to Table 310-16 of the NEC.

4 Drawings indicate the location of all light switches. Where fixtures in a room are controlled by more than one switch, the same lower case letter is drawn adjacent to a switch and each fixture controlled by that switch. Where no lower case letter is adjacent to a switch, all fixtures in the room are controlled by that switch. Provide and install conduit and wire from fixture to switch and between fixtures as required to accomplish switching shown. Do not route branch circuit wiring for light fixtures through switch boxes.

5 Drawings indicate location of all signal outlet boxes. Provide and install conduit system as required for complete connections of system wiring, unless otherwise noted.

6 Control wiring is generally not shown on the plans. Contractor shall refer to control diagrams and provide and install all wiring and raceways required to make all interconnections.

7 All branch circuit wiring No. 12 or No. 10 as noted, all control wiring No. 14, except as noted next to "slash marks" on drawings, or as noted under "Wire," as specified herein.

8 All dimensions, together with locations of doors, partitions, etc. are to be taken from the Architectural Drawings, verified at site by this Contractor.

9 Maintain "as-built" records at all times, showing the exact location of concealed conduits and feeders installed under this contract, and actual numbering of each circuit. Upon completion of work and before acceptance can be considered, this Contractor must forward to Architect vellums (obtained from the Architect at cost) corrected to show the electrical work as installed.

10 Branch circuit conductors shall be #12 minimum and #10 minimum for runs longer than 150 feet.

B Measurements: Before ordering any material or closing in any work, verify all measurements on the job. Any differences found between dimensions on the drawings and actual measurements shall be brought to the Architect's attention for consideration before proceeding.

3.3 FIELD QUALITY CONTROL

A All workmanship shall be first class and carried out in a manner satisfactory to and approved by the Architect.

B This Contractor shall personally, or through an authorized and competent representative, constantly supervise the work and so far as possible keep the same foreman and workmen on the job throughout.

3.4 COORDINATION

A In electrical rooms, where electrical equipment is located at walls with brace framing, provide and install steel channel supports for mounting of electrical equipment away from wall to avoid conflict with brace framing. Steel channel supports shall be unistrut or equal, and shall include all channels, bases, fittings, etc., as required for a complete installation.

B In electrical rooms, Contractor is responsible for installation of electrical equipment within the space provided. Contractor shall provide ¼" scale plans of electrical room layouts, and

elevations of steel channel supports (where used or required) of electrical equipment for review and approval prior to any installation or rough-in.

3.5 INSTALLATION/APPLICATION/ERECTION

A All cutting, repairing and structural reinforcing for the installation of this work shall be done by the General Contractor in conformance with the Architect's requirements.

3.6 TEMPORARY LIGHTING AND POWER

A Provide and install temporary lighting and power systems for the duration of construction, of adequate size to accommodate the required lighting and power loads. Coordinate with other trades to insure adequate sizing.

B Provide distribution equipment as required to support all construction activities.

C Pay all utility company charges (installation and energy) related to temporary power usage during construction.

3.7 FIRE STOPPING AND FIRE RATED PENETRATIONS

A All electrical equipment mounted in, on, or through fire rated construction shall be installed to maintain the fire rating of the construction.

B Provide fire rated pads (or other suitable assembly) around all electrical junction boxes in fire rated walls/ceilings/floors to maintain the fire rating.

C Provide fire rated construction around all recessed light fixtures and/or panel board / cabinets mounted flush in fire rated walls to maintain the fire rating. Coordinate depth of construction with other trades to avoid conflicts.

D Conduit sleeves shall be provided as a means of routing cables through fire-rated walls or floors. Openings in sleeves and conduits used for system cables and those which remain (empty) spare shall be sealed with an approved fireproof, removable sagging material. Sleeves which pass vertically from floor to floor shall be sealed in a similar manner using an approved re-enterable system. Additional penetrations through rated assemblies necessary for passage of tel/data wiring shall be made using an approved method and permanently sealed after installation of cables.

3.8 ADJUSTING AND CLEANING

A All electrical equipment, including existing equipment not "finish painted" under other sections, shall be touched up where finished surface is marred or damaged.

B All equipment, lighting fixtures, etc., shall be left in clean condition, with all shipping and otherwise unnecessary labels removed there from.

3.9 SCHEDULES

A Coordination: Coordinate installation of electrical items with the schedule for other work to prevent unnecessary delays in the total Work.

3.10 WARNING SIGN MOUNTING

A Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet apart.

3.11 PAINTING OF EQUIPMENT

A Factory Applied: Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.

B Field Applied: Paint electrical equipment as required to match finish or meet safety criteria. Painting shall be as specified in the respective equipment section.

3.12 TESTS

A Testing and inspection: See Section 26 08 00 - Testing.

* * *

TESTING SECTION 26 08 00

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Work Included in This Section: All materials, labor, equipment, services and incidentals necessary to perform the testing of the electrical work, including but not limited to the following:
   1. Grounding System.
   2. Lighting System.
   3. Distribution System.
   4. Fire Alarm System.
   5. Lighting control system
   6. Automatic Transfer Switch.
   7. Engine Generators.
   8. Title 24 Acceptance Testing
   9. Photovoltaic system.

B. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.

C. All work shall comply with Sections 26 05 00 – Basic Electrical Requirements.

D. The Contractor shall engage the services of a recognized corporately and financially independent testing firm, Emerson, or equal, for the purpose of performing the following inspections and tests:
   1. System Grounding
   2. Main Switchgear
   3. Feeders

E. The testing firm shall provide all material, equipment, labor, and technical supervision to perform such tests and inspections. The purpose of these tests is to assure that all tested electrical equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications.

1.2 APPLICABLE CODES, STANDARDS, AND REFERENCES

A. All inspections and tests shall be in accordance with the International Electrical Testing Association - Acceptance Testing Specifications ATS-2003 (referred to herein as NETA ATS).

1.3 QUALIFICATIONS

A. Qualifications of Testing Firm shall be as listed in Section 3 of NETA ATS.

PART 2 - PRODUCTS

2.1 This article does not apply to testing.

PART 3 - EXECUTION

3.1 GENERAL

A. Final test and inspection to be conducted in presence of Architect and Owner: Test shall be conducted at the expense of and by the Contractor at a mutually agreed time. Submit written test report.

B. The electrical installation shall be inspected and tested to ensure safety to building occupants, operating personnel, conformity to code authorities and Contract Documents.

3.2 INSPECTIONS AND TESTS

A. Tests: Field tests shall be performed and reports submitted.
   1. Final Inspection Certificates: Prior to final payment approval, deliver to the Owner, with a copy to the Architect, signed certificates of final inspection by the appropriate local authority having jurisdiction.

B. Grounding System:
   1. All ground connections shall be checked and the entire system shall be checked for

continuity. The resistance of the ground system shall be measured using a 3 point fall-of-potential method. The maximum ground resistance shall be three ohms. If the measured ground resistance exceeds three ohms, additional ground rods shall be installed until a value of three ohms or less is obtained.

2. Ground tests shall meet the requirements of the National Electric Code.

C. Lighting Systems:
   1. The interior and exterior lighting systems shall be checked for proper local controls and operation of entire installation, including the operation of the low voltage lighting control system.

D. Power Distribution System:
   1. Tests: Test main switchboard, distribution boards, and panelboards for grounds and shorts with mains disconnected from feeders, branch circuits connected and circuit breakers closed, all fixtures in place and permanently connected and grounding jumper to neutral lifted and with all wall switches closed.
   2. Test each individual circuit at each panelboard with equipment connected for proper operation. Inspect the interior of each panel.
   3. Check verification of color coding, tagging, numbering, and splice make-up.
   4. Verify that all conductors associated with each circuit are in same conduit.
   5. Demonstrate that all lights, jacks, switches, outlets, and equipment operate satisfactorily and as called for.
   6. Perform megger tests of all distribution system feeders prior to energizing. All Cables failing megger tests or with evidence of damage shall be removed and replaced in their entirety (no splices), at no cost to the Owner. Damaged cables may not be field repaired without specific approval of the engineer.

E. Fire Alarm System: Verify that all equipment, components, and devices function as specified. Refer to Section 28 31 00-3.03 for additional testing requirements

F. Lighting Control System: Verify that all equipment, components, and devices function as specified.

H. Automatic Transfer Switches: Verify that all equipment, components, and devices function as specified. See Section 26 36 23 - Automatic Transfer Switch for full requirements for equipment testing - assist manufacturer in performance of all start-up and testing for Owner-supplied equipment.

I. Generators: Verify that all equipment, components, and devices function as specified. See Section 26 32 00 – Standby Emergency Electric Generator for full requirements for system start-up, testing, and training of Owner personnel - assist manufacturer in performance of all start-up and testing.

J. Photovoltaic System: See 26 31 01 Photovoltaic System for testing requirements.

k. Title 24 Acceptance Testing: Contractor shall complete the requirements for Title 24 Acceptance Testing, as per CA Title 24, Part 6.
   1. Perform testing requirements as per Title 24 Lighting Acceptance requirements. Testing shall include construction inspection of installed controls, occupancy sensor testing, manual daylighting controls testing, and automatic time switch controls testing.
   2. Complete and submit required LTG forms for Lighting Control Acceptance and Automatic Daylighting Controls Acceptance.
   3. Obtain required review and approval of Acceptance Forms to allow final certificate of occupancy to be granted.

* * *

SERVICE AND DISTRIBUTION SYSTEM SECTION 26 24 00

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Work Included in This Section: All materials, labor, equipment, services and incidentals necessary to install the electrical work as shown on the drawings and as specified hereinafter, including but not limited to the work listed below.

B. Underground service distribution conduits and cable where noted for power, cable TV, and telephone services at both the new Fire Station Number 5 and the Temporary Fire Station Number 5.

C. Temporary power for construction.

D. Main switchboard, distribution panel, distribution system, panelboards, grounding, overcurrent protective devices.

E. All required incidental work, such as excavating, backfilling and testing.

F. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.

G. All work shall comply with Sections 26 05 00 – Basic Electrical Requirements and 26 27 00 – Basic Electrical Materials and Methods.

H. Provide CBC compliant seismic installation. Provide Special Seismic Certification documentation as per CBC and ASCE/SEI requirements for all equipment defined as 'critical' with an importance factor of 1.5, as per Paragraph 1.10 of Section 26 05 00 – Basic Electrical Requirements (including all equipment on emergency power in this Section).

1.2 RELATED WORK

A. Finishes

B. Mechanical

1.3 SUBMITTALS

A. Comply with the provisions of Section 26 05 00 - Submittals.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Refer to Section 26 05 00 – Basic Electrical Requirements Part 2 - Products

B. List of Equipment Manufacturers:

Main Switchboard
Eaton Cutler Hammer
General Electric
Industrial Electric Manufacturing
Siemens
Panelboards and Distribution Panel
Same manufacturer as main switchboard

2.2 MATERIALS

A. Provide and install secondary service to main switchboard. Comply with all Utility Co. requirements.

B. Furnish and install telephone and cable television service conduits and pullboxes; install conduits to main backboard as shown. All work shall conform to utility company requirements and to Section 26 27 00 – Basic Electrical Materials and Methods.

C. Grounding:

1. Provide and install grounding system as noted on the Drawings.
2. Grounding electrode conductor: bare stranded copper type, #4/O minimum.
3. Install ground wires in rigid conduit.
4. All grounding electrode conductor connections "thermite" or "cad-weld" welded.
5. Use approved pressure type solderless connector or use fusion welding for all connections to and bonding of grounding electrode system. All connections shall be visible, readily accessible for testing purposes. Grounding electrode conductor between the grounding electrode and service equipment: Minimum #4/0.
6. Furnish and install solid copper 3/4" x 10'-0" ground rod(s). Where multiple ground rods are shown, install a minimum of 20'-0" apart. Install ground rods in accessible boxes

with covers. Furnish and install 2-#4/0 bare copper cables between multiple ground rods and main switchboard ground bus.

7. Terminate grounding conduits at equipment with ground bushing, with ground wire connected through bushing.
8. Provide No. 12 stranded (green) THHN conductor from outlet box to ground screw of every receptacle.
9. Ground all isolated sections of metallic raceways.
10. Provide #12 minimum stranded (green) THHN conductor sized per NEC, or as noted, connected continuously throughout branch circuit for all circuits, bonded to panel ground bus, and to all electrical devices and equipment enclosures.
11. Grounding electrode installed as follows:
    a. Place #4/0 bare copper cable in foundation trench; tensioned, supported in such a manner that it cannot be less than two (2) inches from bottom or side of concrete when foundation concrete is poured; not less than one hundred feet of conductor. Embed in foundation with a loop at approximate center, brought out at top of foundation adjacent to building service equipment for connection to service equipment and for bonding to other parts of the grounding system.
    b. Use approved pressure type solderless connector or use fusion welding for all connections to grounding electrode. Connection visible, readily accessible for testing purposes. Grounding electrode conductor between the grounding electrode and service equipment: Minimum #4/0.
    c. Connect grounding electrode system to metallic water service entry metallic cold water pipe (if available) with nonferrous clamp and bare copper cable (sized as required) in conduit. Connection shall be accessible for inspection.
    d. Connect grounding electrode system to building steel as noted on Drawings. Use exothermic weld, connection shall be accessible for inspection.
    e. After installation, test system using the three-point fall of potential method only. Record results and submit to Architect for approval. If resistance to ground exceeds three (3) ohms, install additional ground rods, bonded and interconnected to grounding electrode system. Provide additional grounding until resistance is less than three (3) ohms.

D. Main Switchboard:
1. General: Switchboard shall be distribution panel type, metal enclosure with ground bus and insulated full capacity neutral bus.
2. Equipment:
    a. The switchboard shall be braced for a short circuit current of as indicated on the drawings. Bracing shall be per NEMA and UL standards.
    b. The switchboard shall comply with all the requirements of the Utility Company.
3. The switchboard shall be floor-mounted, self--supporting, dead-front and rear, front-operated, front-connected, distribution type. The enclosure shall be 90 inches high made of cold rolled steel on a structural shape, or formed, steel frame and shall be mounted on two 3-inch, 5-pound continuous channel iron sills, which shall be closed at the ends between the two channels.
4. This contractor is responsible for the complete installation of the new switchboard within the space provided (both vertical and horizontal) and shall verify and/or coordinate all dimensions prior to ordering equipment. Proper allowances should be included to allow complete installation and erection.
5. The switchboard shall be a minimum of 20 inches deep and shall be constructed of National Electrical Code (NEC) gauge steel.
6. The switchboard shall be provided with a cable pull section at the top of the switchboard. Provide a minimum 12 inches of vertical clearance between the cable terminal lugs bolted to the switchboard busses and the top and bottom of the switchboard enclosure. Horizontal pull sections and gutters shall be kept free and clear of busses. Where busses cross vertical pull sections, the busses shall be insulated.
7. All connections between bus bars shall be of a bolted type using Belleville washers. Clamps will not be accepted. All bus bars shall be accurately formed, and all holes shall be made in a manner, which will permit bus bars and connections to be fitted into place without being forced.

8. The design of all current-carrying devices or parts of the switchboard shall conform to the standard specified in the related sections of Underwriters' Laboratories, Inc. (UL) No. UL-891 and National Electric Manufacturer's Association (NEMA) Standard PB-2, except as these characteristics may be modified herein.
9. Bus bars, connection bars and wiring on the back of the switchboard shall be arranged so that maximum accessibility is provided for cable connections from the front.
10. Ampere ratings for rectangular bus bars shall be in accordance with the temperature rise standard of National Electric Manufacturer's Association (NEMA) and the Underwriters' Laboratories, Inc. (UL).
11. The enclosure shall be chemically cleaned by Parkerizing, bonderizing or phoshorizing as a unit after all welding has been completed. The enclosure shall then be painted with a rust- resisting primer coat of paint and shall be finished with a coat of light gray, baked enamel.
12. Each section shall be bussed for the full-connected load of that section. Extend bussing to spare circuit breaker "Spaces." Drill busses for future circuit breakers, and provide breaker connector hardware as required.
13. Provide copper bus bars and connections with silver-plated contact surfaces.
14. The contact surfaces and studs of all devices to which bus connections are made shall also have silver-plated surfaces.
15. Locate ground bus, with a cross-section equal to at least 25 percent of the capacity of the main bus rating, in the back of the switchboard and extend bus throughout the length of the switchboard assembly. Ground each housing of the assembly directly to this bus.
16. Rigidly support all bus and connection bars and current transformers.
17. Fit all nuts and connections with locking devices to prevent loosening.
18. Provide load connections with solderless lugs. Factory-install all devices shown on Drawings as specified herein.
19. Provide half-inch copper braid pigtail at side of switchboard enclosure for termination of signal system ground cables. Pigtail to be located on side of distribution section.
20. Provide a bonding strap from the equipment ground bus to the neutral bus.
21. Provide transient voltage surge protection, integral to or adjacent to the main switchboard when indicated on the plans or where otherwise noted on the plans. Refer to Section 26 43 00 – Transient Voltage Surge Suppressor.

E. Panelboards:
1. Surface or flush mounted, with branch circuits as shown on drawings.
2. Enclosures: code gauge galvanized sheet steel with welded full flange end pieces; stretcher- leveled steel trim, backpan and door.
3. Bussing of copper with silver-plated contact surfaces.
4. Trims on surface-mounted cabinets secured with nickel-plated screws with cup washers, bottom of all trims to have lugs for resting on cabinet flange.
5. Panels shall be 20 inches minimum in width, provided with approved gutter space, barriers and adjustable supports. Doors mounted with concealed hinges provided with combination spring latch and lock. Doors and trims and surface mounted cabinets primed and finished with one coat baked on gray enamel. All visible panel enclosures and covers in finished (occupied) areas shall be painted to match adjacent wall finish.
6. Breakers on same phase to be aligned horizontally. Each panel provided with 5-handle locks.
7. Each branch circuit of panelboards to have a permanently fixed number with one word directory, mounted under celluloid on inside of cabinet door, showing circuit numbers and typewritten description of outlets controlled by breakers. Color code mains and each breaker terminal, same as conductor insulation.
8. Each panel shall be equipped with a copper ground bus.
9. All panels shall be fully bussed to accept future circuit breakers.
10. Panel board submittals shall include diagrams of the circuit breaker arrangements in the panels. Arrange circuit breakers in panels exactly as shown on the panel schedules in the construction documents.

F. Circuit Breakers:

1. General: Circuit breakers shall be molded case rated for 240 volts, multiple or single pole and amperage rating as shown on the drawings, bolt on, manually operated with "de-ion" arc chutes.
2. Main circuit breaker shall be shall be rated to interrupt the available short circuit current as indicated on the drawings.
3. Distribution circuit breakers shall be rated for the amps interrupting capacity noted on the drawings.
4. Branch circuit breakers shall be rated for the amps interrupting capacity or U.L. series rated with the distribution and main circuit breakers, General Electric type THQB or equal, minimum 10,000 A.I.C for 120/208 volt; type TEY or equal.
5. Branch breakers feeding dwelling unit Bedroom 20 Amp branch circuits shall be arc-fault circuit-interrupting type (per NEC 210-12).
6. Where mechanical equipment is U.L. listed for overcurrent protection with fuses or HACR type circuit breakers, provide fuses where a fused switch is shown. Where the overcurrent protection is a circuit breaker provide HACR, (HACR means Heating, Air-Conditioning and Refrigeration) type.
7. Provide switch rated type "SWD" circuit breakers were the circuit breaker is going to be used as a switching device in a panelboard.

G. Magnetic starters: shall be rated in accordance with latest published NEMA standards for size and horsepower rating, Westinghouse A-200 series or equal. Provide with overload sensor in each phase, hand-off-auto switch, red "run" pilotlight, in NEMA 1, NEMA 4X, or NEMA 3R enclosure or in motor control center where indicated. Coil shall be rated 120 VAC. Starters shall be across-the-line non-reversing unless otherwise noted.
   1. Contacts: Across-the-line magnetic starters shall be equipped with double break silver alloy contacts. All contacts shall be replaceable without removing power wiring or removing starter from panel. The starter must have straight-through wiring.
   2. Coils: Coils shall be of molded construction. All coils shall be replaceable from the front without removing the starter from the panel.
   3. Overload Relays and Thermal Units: Overload relays shall be the melting alloy type with a replaceable control circuit module. Thermal units shall be of one-piece construction and interchangeable. The starter shall be inoperative if the thermal unit is removed.

2.3 SHORT-CIRCUIT ANALYSIS AND COORDINATION STUDY FOR NEW FIRE STATION 5

A. Scope of Services:
   1. Provide a current and complete short-circuit study, equipment interrupting or withstand evaluation, and a protective device coordination study for the electrical distribution system, including the 120/208V system and all feeder breakers 100A rating or higher.
   2. The System Coordination and Short-Circuit Analysis Study shall be performed by Emerson, or equal.

B. Submittals:
   1. The studies shall be submitted to the Architect prior to granting final approval of the distribution equipment shop Drawings and/or prior to release of equipment for manufacture.

C. Short-Circuit Study:
   1. The study shall be in accordance with applicable ANSI and IEEE Standards.
   2. The study input data shall include the utility company's short-circuit single-and three-phase contribution, with the X/R ratio, the resistance and reactance components of the branch impedance, motor contributions, base quantities selected, and all other applicable circuit parameters.
   3. Short-circuit momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at the main switchboard bus, building switchboards, distribution panels, panelboard, and other significant locations through the system.

D. Equipment Evaluation Study:
   1. An equipment evaluation study shall be performed to determine the adequacy of circuit breakers, controllers, surge arresters, switches, and fuses by tabulating and comparing the short-circuit ratings of these devices with the available fault currents. Any problem areas or inadequacies in the equipment shall be promptly brought to the Architect's attention.

E. Protective Device Coordination Study:
   1. A protective device coordination study shall be performed to select or to check the selections of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated voltage and current transformers, and low-voltage breaker and fuse trip characteristics and settings.
   2. The study shall also encompass the low-voltage distribution system, including the 120/208V system including all feeder breakers 100A rating or higher. The phase and ground overcurrent protection shall be included, as well as settings for all other adjustable protective devices.
   3. The time-current characteristics of the specified protective devices shall be plotted on appropriate log-log paper. The plots shall include complete titles, representative one-line diagram and legends, associated Campus Utility relays or fuse characteristics, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low-voltage circuit breaker trip curves, and fuse curves. The coordination plots shall indicate the types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, ANSI transformer magnetizing inrush and withstand curves per ANSI C37.91, cable damage curves, symmetrical and asymmetrical fault currents. All requirements of the current National Electrical Code shall be adhered to. Reasonable coordination intervals and separation of characteristics curves shall be maintained. The coordination plots for phase and ground protective devices shall be provided on a complete system basis. Sufficient curves shall be used to clearly indicate the coordination achieved to the main breaker or fused device, the feeder breaker, and the primary protective device.
   4. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type, range of adjustment, and recommended settings. A tabulation of the recommended power fuse selection shall be provided for all fuses in the system. Discrepancies, problem areas, or inadequacies shall be promptly brought to the Architect's attention.

F. Study Report:
   1. The results of the power system study shall be summarized in a final report. Five (5) bound copies of the final report shall be submitted to the Architect.
   2. The report shall include the following Sections:
      a. Description, purpose, basis, written scope, and a single-line diagram of the portion of the power system, which is included within the scope of study.
      b. Tabulations of circuit breaker, fuse, and other equipment ratings versus calculated short-circuit duties, and commentary regarding it.
      c. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding it.
      d. Fault current tabulations including a definition of terms and a guide for interpretation.
      e. Tabulation of appropriate tap settings for relay seal-in units.

PART 3 - EXECUTION

3.1 GENERAL
   A. Refer to section 26 05 00 for details of work under this section.

3.2 INSTALLATION/APPLICATION/ERECTION
   A. Electric Services: For each site contact the local electric utility company service planning representative and coordinate with and arrange with the utility company for electric services to the projects, including finalization of service application as required. Furnish and install all materials and labor necessary for complete installation as noted on drawings. Submit shop drawings and obtain approval from the utility company prior to fabrication. Also provide and install temporary power as required for construction operations.
   B. Telephone Service: For each site contact the local telephone utility company service planning representative and coordinate with and arrange with the telephone utility company for telephone service to the projects, including finalization of service application as required. Furnish and install all materials and labor necessary for complete installation as noted on the drawings and as required by the utility company.

C. Cable TV Service: For each site contact the local cable utility company service planning representative and coordinate with and arrange with the utility company for cable TV service to the projects, including finalization of service application as required. Furnish and install all materials and labor necessary for complete installation as noted on the drawings and as required by the utility company.
D. Pay all costs chargeable to Owner for installation of new utility services.
E. Excavate and trench as necessary for the electrical installation, and when the work has been installed, inspected and approved, backfill all excavations with clean earth from excavation, or imported sandy soil in maximum 8" (eight-inch) layers, moisten and machine tamp to 95% compaction, and restore the ground and/or paving or floor surfaces to their original condition.
F. Switchboard and Distribution Panels Installation: Provide mounting channels for grouting into floor. Channels shall be properly drilled to receive the switchboard placed flush in floor, leveled and secured in place prior to pouring of floor, of length as required for switchboard. Bolt or weld switchboard to channels.
G. Motor Connections:
    1. Install motor circuits complete for all motors by other trades
    2. Furnish and install all disconnect switches, outlet boxes, etc., as required by code.
    3. All motor and temperature control low voltage wiring shall be installed and connected by Division 23 Section of specifications, unless otherwise indicated on electrical drawings.

3.3 TESTS
A. Testing and Inspection: See Section 26 08 00 - Testing.

* * *

BASIC ELECTRICAL MATERIALS AND METHODS SECTION 26 27 00

PART 1 - GENERAL

1.1 WORK INCLUDED

A Work included in this Section: All materials, labor, equipment, services, and incidentals necessary to install the electrical work as shown on the drawings and as specified hereinafter, including but not limited to the work listed below:

1 Raceways, feeders, branch circuit wiring, wiring devices, safety switches and connections to all equipment requiring electric service.

B Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.

C All work shall comply with Section 26 05 00.

1.2 RELATED WORK

A Division 9 - Finishes

B Division 23 – Heating, Ventilating, and Air Conditioning.

1.3 SUBMITTALS

A Comply with the provisions of Section 26 05 00 – Basic Electrical Requirements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A Refer to Section 26 05 00, Basic Electrical Requirements, Part 2 - Products.

B List of Equipment Manufacturers:

Conduit and Conduit Fittings
Allied Tube and Conduit
Western Tube and Conduit
LTV Steel Tubular
National Electric Products
AFC
Republic Steel Corporation
Rome Cable Corporation
United States Steel Corporation
Killark Electric Manufacturing Company
Raco
VAW Aluminum Company
Bridgeport
Steel City
Thomas & Betts
Carlon
O.Z. Gedney
Appleton
Regal

Wire and Cable (600V)
American Wire Company
General Wire and Cable Corporation
Okonite Company
Rome Cable Corporation
Cerrowire
American Insulated Wire
AFC Cable Systems

Essex
Simplex Wire and Cable Company

Solderless Lugs and Grounding Connections
Burndy Engineering Company, Inc.
O.Z. Gedney Company, Inc.
Penn Union Electric Corporation
Thomas and Betts Company, Inc.

Pull Boxes, Gutters, Special Cabinets
Square D Company
Columbia Electric Manufacturing Company
General Electric Company
Westinghouse Electric Corporation
Circle Awalt

Outlet Boxes
Appleton Electric Company
Killark Electric Manufacturing Company
Lew Electric Fittings Company
National Electric Products Corporation
Raco
Steel City Electric Company
Carlon
Bowers

Floor Boxes
Steel City Electric Company
Harvey Hubbell, Inc.
RCI
Walker

Wiring Devices
Leviton
Arrow-Hart
Harvey Hubbell, Inc.
Lutron
Bryant

Conduit Racks, Hangers
General Electric Company
Killark Electric Manufacturing Company
Caddy
National Electric Products Corporation
Republic Steel Corporation
Rome Cable Corporation
United States Steel Corporation
VAW Aluminum Company
Superstrut
B-Line

Safety Switches (Disconnect and Fusible)
Square D Company
Cutler Hammer, Inc.
General Electric Company
Westinghouse Electric Corporation

Fuses
Bussman Manufacturing Company
Chase-Shawmut Company

Firestopping
3M
Nelson

2.2 MATERIALS

A Raceways: Only the raceways specified below shall be utilized on this project. Substitutions shall be pre-approved in writing. All bare conduit ends (stub-ups or stub-outs) shall be provided with bushed ends or manufactured insulated throat connectors:

1 Rigid Type - hot dip galvanized or sherardized steel, use on all exterior locations, below grade or in concrete slab, and to 18" on either side of structural expansion joints in floor slabs (see item 15 below), with completely watertight, threaded fittings throughout.

a All rigid steel conduit couplings and elbows in soil or concrete or under membrane to be ½ lap wrapped with Scotch #50 tape and threaded ends coated with T&B #S.C.40 rust inhibitor prior to installation of couplings.

b All rigid steel conduit stub-ups from slab or grade to 6" above finished grade level shall be Robroy or Ocal coated only.

2 In lieu of rigid steel conduit for power and control raceways and branch circuit conduits in soil or concrete slabs, "Schedule 40" PVC with Schedule 80 PVC conduit elbows and stub-ups may be used with code size (minimum No. 12) ground wire. A "stub-up" is considered to terminate 6" above the finished surface.

a Schedule 80 PVC conduit shall be used in all concrete footings or foundations and to 18" of either side of footings or foundation walls.

b Schedule 80 PVC conduit shall be used in all concrete masonry unit (CMU) walls or columns.

c All conduit runs in concrete floor slabs (where allowed) shall be installed to comply with all applicable UBC and structural codes to maintain the structural integrity of the floor slab. Where conflicts occur, alternate routing shall be provided at no additional cost to the Owner.

3 Intermediate metal conduit shall be used in all exposed interior locations, except that electrical metallic tubing may be used in some locations as noted below. Utilize steel compression type fittings for all exposed conduit runs, unless otherwise noted. Cast fittings are unacceptable.

4 Electrical metallic tubing may be used exposed in electrical and mechanical rooms and in unfinished spaces and in concealed and furred spaces, made up with steel watertight or steel set screw type fittings and couplings. Set screws shall have hardened points. Cast fittings are unacceptable.

5 Use flexible conduit for all motor, transformer and recessed fixture connections, (minimum 3/4"); "Seal- tite" type used outdoors, and in all wet locations, provide with code size (minimum No. 12) ground wire in all flexible conduit. No flex conduit in walls – EMT or better only. Flex conduit to be Robroy or Ocal PVC coated for corrosion protection.

6 Conceal conduit in ceiling, or walls of all areas where possible, all exposed conduits installed parallel to building members.

7 Fasten conduits securely to boxes with locknuts and bushings to provide good electrical continuity.

8 Provide chrome escutcheon plates at all exposed wall, ceiling and floor conduit penetrations.
9 Support individual suspended conduits with heavy malleable strap or rod hangers; supports for ½ inch or 3/4 inch conduit placed on maximum 7-foot centers; maximum 10-foot centers on conduits 1 inch or larger.
10 Support multiple conduit runs from Kindorf B907 channels with C-105 and C-106 straps.
11 Conduit bends - long radius.
12 Flash conduits through roof, using approved roof jack; coordinate with General Contractor.
13 To facilitate pulling of feeder conductors, install junction boxes as shown or required.
14 All empty conduits on the project shall be provided with a nylon pull rope to allow pulling of future conductors intended for the specific raceway. Provide plastic wire-tie style nameplate tags on each end of pull rope with printed identification of conduit use and the location of the opposite end of the rope. Pull ropes for telephone and cable tv service conduits shall meet the respective utility company requirements.
15 Where conduits pass through structural expansion joints in floor slab, rigid galvanized conduit shall be used 18" on either side of joint, complete with Appleton expansion couplings and bonding jumpers, or equal. All above grade expansion joint crossings shall also utilize expansion joint couplings or flex conduit transitions as required for each particular installation. No solid conduits shall be allowed to cross expansion joints without proper provisions for building and seismic movement.
16 Minimum cover of conduits in ground outside of building - 36 inches, unless otherwise noted.
17 Provide and install exterior wall conduit seals and cable seals in the locations listed below. Coordinate installation and scheduling with other trades:
   a Conduit seals through exterior wall or slab (below grade): O.Z. Gedney series "FSK" in new cast in concrete locations, series "CSM" in cored locations.
   b Conduit seals through exterior wall or slab (above grade): O.Z. Gedney series "CSMI."
   c Cable seals at first interior conduit termination after entry through exterior wall or slab: O.Z. Gedney series "CSBI." Coordinate quantity of conductors at each location.

B Outlet Boxes and Junction Boxes. Verify all backbox requirements with devices to be installed prior to rough in.
1 One-piece steel knockout type drawn boxes, unless otherwise noted, sized as required for conditions at each outlet or as noted.
2 Flush-mounted boxes equipped with galvanized steel raised covers for device mounting flush with finished surface. Provide extension rings as required on all acoustical or additional wall treatment areas to bring top of cover flush with finished surface (coordinate with architectural drawings). Devices shall be capable of being tightly mounted to boxes without distorting or bending device or mounting hardware.
3 Boxes for fixture outlets: 4-inch octagon or larger as required, or as noted.
4 Switch and receptacle outlets - not smaller than 4-inch-square in furred walls, with raised cover for single device; ganged where required.
5 Outlet and switch boxes for wet locations, cast aluminum FS or FD type with cast aluminum gasketed spring lid cover. Weatherproof "Bell" type boxes are not acceptable.
6 All connectors from conduit to junction or outlet boxes shall have insulated throats. Connectors shall be manufactured with insulated throats as integral part. Insertable insulated throats are unacceptable.
7 Outlet boxes for cable TV, telephone/data, 4" square or larger as required or noted, multi-ganged for telephone, data, and other services where indicated on the drawings.
8 Conduit Bodies: Malleable iron type, with lubricated spring steel clips over edge of conduit body, O-Z/Gedney type EW, or equal.

9 Floor Boxes:
- a Classification and Use: Floor boxes shall have been examined and tested by Underwriters Laboratories Inc. to meet UL514A and Canadian Standard C22.2 and shall bear the appropriate label. Floor boxes shall conform to the standard set in the National Electrical Code. Multi-compartment boxes shall have been evaluated by UL to meet the applicable U.S. and Canadian safety standards for scrub water exclusion when used on tile, terrazzo, wood, and carpet covered floors.
- b Multi-Compartment Boxes:
  - (1) Boxes shall be fully adjustable, providing a maximum of 1-7/8 (RFB4) 2" (RFB9/RFB11) inch pre-pour adjustment, and a maximum of 3/4 inch post-pour adjustment.
  - (2) Boxes shall provide a series of device mounting plates that will accept both duplex power devices, as well as plates that will accommodate connectivity and AV outlets with modular inserts.
  - (3) The box shall provide ¾", 1" and 1 ¼" conduit size openings with 2" KO for larger size boxes.
  - (4) Cover shall be cast aluminum. Lid shall be offered with solid, flush surface for tile, wood or terrazzo and an insert option for carpet inlay.
  - (5) Cover options shall support loads from 390LBS to 3000LBS
  - (6) Use cast iron boxes for on-grade applications (RFB4-CI-1). Stamped steel allowed for above grade applications (RFB-4 and RFB-4DB).

10 Pull boxes: All site pull boxes shall be flush in-ground concrete, with engraved concrete lids identifying service use (i.e. electrical, signal, fire alarm, etc.). Christy or equal with all required extensions to provide box and conduit depths shown or required.
- a Provide concrete covers for all boxes in planted or paved areas (up to available concrete cover size).
- b Provide galvanized steel covers for all larger boxes (when concrete is not available), or in traffic areas. No cast iron covers.
- c Provide galvanized steel H20 rated covers and installation of box rated for H20 in all traffic areas.
- d All covers to be completely flush with finished adjacent surfaces.
- e Provide bolted covers and slab bottoms (with grouted perimeter) or vault type boxes for all electrical distribution and signal system pull boxes used for site distribution. Branch circuit power or signal pullboxes may be collars and tops only (no slab bottom required).
- f Provide pullboxes per utility company specifications for all electrical primary and secondary services and for cable TV and telephone service runs. Verify exact size and type prior to order with each utility company.

C Wire and Cable:
1 600-volt class where used for or run with line voltage power wiring, insulation color coded, minimum No. 12 awg for power branch circuits, No. 14 for power control circuits, and wiring size and type as directed by signal system manufacturer for each signal system.
2 All conductors shall be stranded copper.
3 Insulation type:
- a Standard locations: #12 to #1 AWG: THWN for wet locations and THHN for dry locations. #1/0 through #4/0 AWG: XHHW (55 Mils). 250MCM and larger: XHHW (65 Mils). All wire sizes used shall be based on a 75-degree insulation rating, unless specifically used with 90 degree rated breakers and devices.
- b High temperature and non-standard locations: Provide wire type and insulation category suitable for area of use as defined in NEC table 310-13.

4 Conductors unless otherwise noted on drawings shall be stranded. All conductors #10 or smaller shall be stranded.

5 Provide signal system wiring for each system to meet the system manufacturers requirements and recommendations for each device or equipment type. Signal wiring systems shall be provided with shielding and/or insulation type and cable quantities as directed by the manufacturer, and meet all NEC requirements for locations used.

6 Install all wiring (low voltage and line voltage) in conduit unless noted otherwise in the drawings, but do not pull into conduit until plastering and taping have been completed and conduits and outlets have been thoroughly cleaned and swabbed as necessary to remove water and debris.

7 Megger test all feeders prior to energizing. See section 26 08 00 for additional information.

8 Approximately balance branch circuits about the neutral conductors in panels.

9 Connections to devices from "thru-feed" branch circuit conductors to be made with pigtails, with no interruption of the branch circuit conductors.

10 Neutral conductor identified by white outer braid, with different tracers of "EZ" numbering tags used where more than one neutral conductor is contained in a single raceway.

11 Neatly arrange and "marlin" wires in panels and distribution panelboards with "T and B Ty-rap" or approved equal plastic type strapping.

12 All wire and cable shall bear the Underwriters' Label, brought to the job in unbroken packages; wire color-coded as follows:

Voltage	Phasing	A	B	C	N
120/240	1PH3W	Black	Red		White
120/208	3PH4W	Black	Red	Blue	White
208	3PH3W	Black	Red	Blue	--

13 The equipment-grounding conductor shall be insulated copper; where it is insulated, the insulation shall be colored green.

14 Label each wire of each electrical system in each pull box, junction box, outlet box, terminal cabinet, and panelboard in which it appears with "EZ" numbering tags indicating the connected circuit numbers.

15 Provide permanently affixed adhesive labels with machine printed lettering (min. 1/8" high) at junction boxes serving fixtures that are supplied by (2) electrical sources (i.e. normal and emergency lighting). Label to read "CAUTION - This light fixture is powered by (2) separate sources. The normal power source breaker and the emergency power source breaker must be turned off before servicing this light fixture."

16 Install feeder cables in one continuous section unless Architect approves splices. Exercise care in pulling to avoid damage or disarrangement of conductors, using approved grips. No cable shall be bent to smaller radius than the spool on which it was delivered from the manufacturer. Color code feeder cables at terminals. Provide identifying linen tags in each pullbox.

D Switches: Model numbers are Hubbell or equal, color to be selected by architect, unless otherwise noted. All devices connected to the generator system shall be red. All switches to utilize screw terminals for wire connections – no plug-in terminations:

1 Single Pole - No. 1221 or equal
2 Three Way - No. 1223-2W or equal
3 Momentary contact - No. 1557 or equal
4 Pilot Light (on with load on) – No. 1221-PLC, or equal.
5 Motor Rated Double Pole – No. 7832, or equal.
6 Motor Rated Three Pole – No. 7810-UD, or equal

E Receptacles: Mounting straps and contacts shall be one piece design, (no rivets), constructed of minimum .050" solid brass. Base shall be high strength, glass reinforced nylon. Device shall accept up to #10 wire. Model numbers are Leviton or equal, color to be selected by architect, unless otherwise noted. All devices connected to the generator system shall be red.

1 20A 3PG 125 volt duplex - No. 5362

2 20A 3PG 125 volt ground fault interrupter receptacle, no indicator light, with safety lock-out action - No. 8899-W or equal. Through wiring to down stream GFI designated receptacles is not acceptable.
3 Special appliance receptacles: Match NEMA configuration of equipment plug.
4 Clock Hanger 20A 3PG 125 volt receptacle, with stainless steel plate. Hubbell #5361-CH, or equal.

F Plates: Leviton, or equal, except as noted:
1 The color of all faceplates shall match the color of the devices installed under/in the faceplate, except as specifically noted otherwise. Devices connected to emergency power shall be Red and engraved "EMERGENCY".
2 For flush outlet boxes, for switches, and receptacles: nylon, color to be selected by architect, unless otherwise noted.
3 Plates for surface-mounted outlets: galvanized steel unless otherwise noted.
4 Weatherproof duplex receptacle plates for exterior locations with ground fault interrupter receptacles in type FS or FD boxes – Appleton #FSK-1VDR or compatible equal. Verify cover compatibility with box type and device installed.
5 Weatherproof "in-use" cover, vertical or horizontal mount, for exterior with GFCI receptacles in type FS or FD boxes – Die-cast metal alloy, Taymack MX series or equal with openings to match installed devices.
6 Locking plates for duplex receptacles where noted; Pass & Seymour #WP26-L (non weather proof).
7 Locking plates for duplex exterior GFCI receptacles (or in wet or damp locations); Heavy duty cast aluminum flush cover with locking latch and key, Pass & Seymour #4600 with appropriate mounting plate for type of device installed. Coordinate backbox requirements and finished wall trim out with wall installer prior to rough in to insure an adequate and neat trim appearance upon completion.

G Equipment Disconnects: All disconnects shall be located to allow proper code required clearance in each area. Locations shown on drawings are diagrammatic only. The contractor shall coordinate exact locations in the field (with other trades) prior to rough-in to insure proper clearances.
1 Motor Disconnect Switches and Safety Switches: General Electric Company Heavy Duty Type "THD", cover interlocked with operating handle so that cover cannot be opened with switch in closed position and switch cannot be closed with cover in open position. 240V rating, single or multi-pole as required or as noted on drawings, in Nema 1 enclosure indoors or Nema 3R enclosure outdoors unless otherwise noted. Provide dual element motor circuit fuses sized as recommended by equipment manufacturer (for final equipment actually installed).
2 Code required disconnects: Provide a local disconnect in addition to the branch circuit protection device for all equipment as required by code (whether shown or not). Disconnects shall consist of a motor rated switch (or disconnect) for all motor loads less than 3/4HP or other suitable disconnect sized to match branch circuit conductors and load current of equipment, with number of poles as required.

H Lugs and Connectors: Thomas and Betts "lock-tite", for No. 4 and larger wire; "Scotchlock" fixed spring type with insulator for No. 6 and smaller wire.
1 All splices made up with wire nut connectors shall be solidly twisted together with electricians pliers before connector is installed to ensure a proper connection in the event of wire nut failure. No exceptions.
2 Connectors listed or labeled for "no wire twisting required" are <u>not</u> an acceptable substitute for actual wire twisting.
3 Utilize porcelain type connectors in all high temperature environments (above 105 degrees Celsius).

I Splice Insulation: "Scotch" electrical tape with vinyl plastic backing or rubber tape with protective friction tape for interior work.
1 Provide watertight cast splices for all conductors in site pullboxes or wet locations.

J Identification: Refer to Section 26 05 00.

K Firestopping: As manufactured by 3M Fire Protection Products or equal.

1 Fire-rated and smoke barrier construction: Maintain barrier and structural floor fire and smoke resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound vibration absorption, an at other construction gaps.

2 Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetration type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall penetrations. Systems or devices must be asbestos free.

PART 3 - EXECUTION

3.1 GENERAL

A Refer to Basic Electrical Requirements - Section 26 05 00 – Basic Electrical Requirements for work under this Section.

3.2 TESTS

A Testing and Inspection: See Section 26 08 00 - Testing.

* * *

PHOTOVOLTAIC SYSTEM SECTION 26 31 01

PART 1 – GENERAL

1.1 DESCRIPTION

A The Contractor shall include in their bid all additional design and engineering costs associated with the PV system design to be submitted, including all materials, installation, testing, utility company coordination, and training. The architectural drawings and these specifications shall be used as the performance criteria for the design and installation of a complete operational PV system.

1.2 WORK INCLUDED

A Work included in this Section: All design, materials, labor, equipment, services, and incidentals necessary to install a complete Photovoltaic (PV) System as specified hereinafter, including but not limited to the work listed below.

B The system shall be utility grid connected with no storage batteries. The contractor shall be responsible for all required utility company coordination, approval, and applications for the complete interconnection of the PV system with the utility company grid, including bi-directional utility meter.

1.3 SCOPE

A The system shall consist of an array of framed photovoltaic modules, all mounting hardware, terminal boxes and combiner panels, quick-connect electrical connectors, DC wiring, DC disconnects, utility interactive inverter, AC disconnect, isolation transformer, AC feeder, main PV system disconnect, MET station, and a complete data acquisition and monitoring system to allow the Owner to monitor and utilize the collected data over the Owner network.

B The work shall include furnishing all labor, materials, and equipment necessary to form a complete installation, ready for operation to produce solar power at the site.

C The installing contractor shall be responsible for adequate clearance and equipment space within the allotted roof area and existing interior building area. All equipment and sizes / clearances shall be coordinated with the architect and Owner prior to rough-in.

D The system installer shall submit for and pay for the required permits and inspections with the local AHJ and utility company.

E The installer shall complete all of the required paper work for the utility interconnection agreement contract in conjunction with the Owner's input and approval, including rate schedule (i.e. TOU or other) designations. In order for the Installer to act on behalf of the Owner, the Installer (in conjunction with the Owner) shall submit to the utility company the proper authorization forms.

F The installer shall also be responsible for and submit for, pay filing fees, and obtain any relevant buy-down incentive rebates available for the system and properly credit the value to the Owner. This shall include application (and payment) of all required "reservation" applications as well as system applications and system certification and testing with the utility company to receive the final rebates.

G The incentives and other credits may be claimed buy the Installer / Contractor if properly identified and allotted for in the Bid price and contract (for credit to the Owner).

H System installation shall include the programming, set-up, and commissioning of a web based data acquisition system and interactive data application to allow public viewing of the real-time system performance and past historical performance.

1.4 WARRANTIES

A The system shall be warranted by for a period of five (10) years from system start-up and acceptance by the Owner.

B The photovoltaic panels shall be covered by the manufacturer's warranty for a minimum of 25 years.

C The inverters shall be covered by the manufacturer's warranty of 10 years.

D System installation shall be such that it does not affect the roof warranty.

1.5 APPLICABLE GUIDELINES / REGULATIONS / STANDARDS

A CPUC approved Electric Rule 21 – Generating Facility Interconnections

B UL1741 (Inverters, Converters, and Controllers for Independent Power Systems)

C UL1703 (Standard for Flat-Plate Photovoltaic Modules and Panels).

D IEEE 929 (2000) – Recommended Practice for Utility Interface of Photovoltaic (PV) Systems.

E IEEE 1262 (1995) – Recommended Practice for Qualifications of Photovoltaic (PV) Modules.
F NEC Articles 690 and 702.
G CAL Fire - Solar Photovoltaic Installation Guidelines

1.6 QUALITY ASSURANCE
A Underwriters' Laboratories shall certify the system.
B Contractor Qualification – The contractor shall be approved by the PV equipment manufacturer(s) to install the PV materials.

1.7 SUBMITTALS
A Submit the following for approval:
1 Roof plans with the PV System layout (based on submitted panel).
2 Single line Diagrams indicating all required connections and utility tie-in.
3 Array calculations including string design, string amperage, array amperage (including short circuit currents), and DC voltages (maximum and minimum based on coldest record low and average high ambient temperatures).
4 DC combiner boxes with fusing.
5 DC/AC Inverter(s).
6 Isolation Transformer (if applicable).
7 WH Meter and Logger.
8 Data Acquisition System & MET Station.
9 PV System weights.
10 PV Modules.
11 Installation Manuals.
12 Operation and Maintenance manuals.
13 Web based data acquisition system and application software.
14 Mounting hardware.
15 Wiring (AC and DC).
16 Disconnects.
17 Placards (with all code and utility required designations).
18 Testing and certification / commissioning results (upon completion).

1.8 DELIVERY, STORAGE, AND HANDLING
A All equipment and panels shall be handled with care so as not to damage the delivered products. All equipment shall be installed in new and neat condition.
B Appropriate protective clothing shall be worn when handling the equipment. Such clothing shall include hard hats and steel-toe boots when lifting materials to roof, and insulated gloves when working on an active system.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A Acceptable system manufacturers/vendors shall have been in the business of producing and/or installing similar commercial grade solar photovoltaic systems for the last 2 years minimum (50 kW systems or higher). Manufacturers shall provide their latest line of equipment, meeting all current industry standards. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
B The basis of design for the minimum performance of the system is the Sharp #NU-U240F2 module with SMA Inverter, with characteristics as outlined below.
C Other modules and equipment are acceptable when meeting the minimum system performance listed herein and complying with all other technical aspects of the system as listed herein.

2.2 MATERIALS
A The PV modules used in the basis of design have the following physical properties and are pre-approved. Alternate modules shall have similar values:
1 Module Weight - 38 lbs. max. each
2 Module Dimensions - 58.4" x 39" x 1.4" max.
3 All PV modules shall be UL 1703 listed.

B The following Electrical Module characteristic shall be used as a minimum standard for any design submitted.
1 Power Output (Pmax) - 240 Watts; STC
2 Open Circuit Voltage (Voc) – 37.4 Volts; STC
3 Maximum Power Voltage (Vmp) – 30.1 Volts; STC
4 Short Circuit Current (Isc) - 8.65 Amps; STC
5 Maximum Power Current (Imp) - 7.98 Amps; STC

C The inverter shall be by Satcon, SMA America, Solaron, or equal, sized as required to support the PV module production load within the rating of the equipment, together with all other components as follows. All inverters shall be CEC approved and shall be utility line interactive type:
1 Nominal AC Voltage (1-phase, arranged for balanced 3-ph system + 10%)
a 208 VAC
b Nominal AC Frequency (+ 0.5 Hz)
(a) 60 Hz
c Line Power Factor (Above 20% rated power)
(a) >0.99
d AC Current Distortion (At rated power)
(a) <5% THD
e Maximum Open Circuit Voltage DC
(a) 600 VDC
f Power Tracking Window Range
(a) No higher than 315 VDC (low end) to a maximum of 600 VDC (high end).
g Maximum Ripple Current (% of rated current)
(a) <5%
h Peak Inverter Efficiency
(a) >95%
i Standby Tare Losses
(a) <70 watts total
j Temperature Range Ambient
(a) -4° F to 122° F (-20° C to 50° C)
k Enclosure Environmental Rating
(a) NEMA 3R
l Enclosure Environmental Rating
(a) Galvaneal folded steel enclosure
m Relative Humidity (non-condensing)
(a) 0-95%
n Sound level
(a) <65dB(A)
o Array Configuration
(a) Negative or Positive grounded
p Cooling Method
(a) Forced convection cooling
q Protective Functions
(a) Standard wakeup voltage, wakeup time delay, shutdown power, shutdown time delay, AC over / under voltage and time delays, AC over / under frequency and time delays, ground over current, over-temperature, AC and DC over current, DC over voltage
r User Display
(a) Standard-LCD with on/off capability
s AC Disconnect
(a) Load break and back feed rated
t DC Disconnect
(a) 600 VDC load break rated
u Isolation Transformer (where used)
(a) High efficiency mounted within same enclosure
v Communications Software

(a) Serial communications and control software
(b) UL 1741 listed.
(c) Seismic Rating for local area.
(d) Internal combiner panel to allow connections of sub-arrays at the Inverter without the use of additional equipment.
(e) Provide a placard on the Inverter per section 3.1 below.

D Inverter to electric service equipment interface shall be as follows:
1 120/208 VAC, 3-Phase, 4-Wire, 60Hz.
2 Connected on the supply side of the main switch per 2008 NEC 690.64(A).
a If a GFP or bussing / breaker conflict exists with the existing equipment, the PV systems shall be connected on the line side of the main and GFP systems per 2008 NEC 690.64(A).
b Provide a placard on the Main Switchboard to identify the two sources of power feeding the equipment. Also provide a placard identifying the inverter breaker position and its intended purposes and location. Refer to section 3.01 below.

E All AC interconnecting feeders shall be sized to NEC Table 316 (75 degree column) based on associated disconnect amperage. Conduit fill to 40% max. Include temperature derating as required for the ambient temperatures and roof conditions per NEC. .Provide equipment grounding conductor in each conduit.

F All AC circuits to be 3-wire + ground. All grounding per NEC 690, Part V.

G All DC circuits and feeders sized to NEC table 316 (90 degree column) based on associated disconnect amperage. Minimum ampacity shall be 156% of the rated short circuit current available to be carried on the specific conductor. Conduit fill to 40% max. Include temperature derating as required for the ambient temperatures and roof conditions per NEC. Provide equipment grounding conductor in each conduit.

H All DC circuits to be 2-wire + ground.

I All AC and DC wiring in conduit to be RHW-2, THWN-2, or XHHW-2 (90 degree) wet rated for use with 90 degree listed terminals on PV equipment.

J All exposed DC wiring to be USE-2 or SE (90 degree) wet rated and sunlight resistant.

K All above ground exposed conduit shall be rigid galvanized steel or aluminum with threaded fittings or painted EMT with water-tight compression fittings. All interior conduit to be EMT with steel set-screw fittings (no cast fittings).

2.3 ARRAY MOUNTING

A Modules shall be roof mounted as indicated on the drawings, with appropriate racking hardware and structural attachments.

B Provide structural engineering calculations and/or certifications that the design meets the requirements of the existing building structure and can be adequately supported.

2.4 WIND LOADING

A The system shall minimize wind loading by mounting the modules flat to the roof.

B Provide structural engineering calculations and/or certifications that the design meets the requirements for wind loading and can be adequately supported and maintained on the roof.

2.5 MISC. SYSTEM REQUIREMENTS

A All exterior equipment to be sunlight and UV resistant as well as rated for elevated temperatures at which they are expected to operate (on roofs in hot sunlight).

B Heavy duty urethane sealants shall be used for all non-flashed roof penetrations.

C No dissimilar metals allowed to contact (use plastic or rubber washers)

D No aluminum in contact with concrete or masonry materials.

E Use high quality stainless steel fasteners only.

F Structural members for PV supports should be corrosion resistant aluminum (6061 or 6063), hot dipped galvanized steel (per ASTM A 123), coated or painted steel (in non-corrosive environments only), or stainless steel (in corrosive environments).

G All PV modules to be installed such that they are 100% free from shade between 8am and 5pm daily.

2.6 SYSTEM ELECTRICAL

A The modules shall be interconnected using cable assemblies. The pigtails shall be quick-connect electrical wiring connections rated for the application (90 degree rated).

B The array shall have at least one terminal box, providing a watertight entry to the raceway system leading to the combiner box and Inverter(s).
C Full specifications of the inverter shall be supplied as part of the system submittal.
D All major components of the systems and the installation procedures shall meet National Electrical Code requirements, including Article 690.
E The inverters shall automatically drop-off-line when normal utility power is lost to avoid un-intentional islanding effects. Drop-off to be activated by over-voltage (110%) and under-voltage (88%), and shall be adjustable. Frequency drifts outside 59.3 to 60.5 Hz for more than 10 cycles shall also activate automatic drop-off. Automatic reconnection shall not occur until the normal utility power has been stable for at least 60 seconds.
F All electrical system equipment shall be properly rated to withstand and interrupt (in the case of over current protection devices) the available fault current at the point of use.
G The system shall be capable of operating between a power factor of 0.9 lagging to 0.9 leading.
H All required overcurrent protection and electrical bussing sizes per NEC 690.
I Provide a grounding electrode connection from the inverter assembly to the nearest building steel per NEC 690.45 and the manufacturer's instructions. Inverters shall have GFCI protection, allowing grounding per NEC Table 250.122.
J The Main PV System Disconnect (adjacent to the main service panel) shall be clearly labeled and located within 10 feet of the main service meter location per Utility Company requirements.

2.7 MONITORING

A A Data Acquisition and Monitoring System shall be provided as part of the System. The system shall allow measurement, calculation, and display of the following items (at minimum):
1 Ambient temperature
2 Wind speed
3 Solar irradiation
4 System electrical functions (instantaneous and accumulated power output (kW and kWH), AC and DC system voltage and amperage, and peak value tracking with associated time stamps).
5 Pounds of Co2 emissions avoided from the generation of PV energy at the site (compared to conventional coal and gas production methods).
B Provide a Web based software application to allow interactive display and user requests of system performance, including historical data.
C Provide a MET station located within proximity to the PV array.
D Load software on owner provided web page (URL) and train owner in operation and maintenance of software and related monitoring functions.

PART 3 - EXECUTION

3.1 REQUIRED PLACARDS

A All placards shall be machine generated phenolic type with red background and white lettering, affixed to equipment with stainless steel screws (no adhesives allowed). Minimum lettering size to be 1/4" unless otherwise noted or required for legibility.
B Provide a placard clearly visible at each main service panel or switchboard to identify both sources of power, with the following wording in 1/4" high lettering per NEC 690.64(B)(4): "Warning - This Service Is Fed By Two Sources Of Power - The Utility Service Main Disconnect And The PV System Main Disconnect - Both Services Must Be Disconnected To Remove Power From The Panel (Switchboard)".
C Provide a placard on the PV system input circuit breaker at each main service panel or switchboard with the following wording in 1/4" high lettering per NEC 690.64(B)(7): "Warning - Inverter Output Connection - Do Not Relocate This Overcurrent Device".
D Provide a placard on all disconnects with the following wording in 1/4" high lettering per NEC 690.17: "Warning - Electric Shock Hazard - Do Not Touch Terminals - Terminals On Both The Line and Load Sides May Be Energized In The Open Position".
E Provide a placard on each Main PV System Disconnect (adjacent to each main service panel or switchboard) with the following information in 1/4" high lettering per NEC 690.53: "Photovoltaic Power Source Disconnect - Operating Current: XX Amps; Operating voltage: 480 VAC; Maximum System Voltage: 480 VAC; Short-Circuit Current: XXX Amps", where XX is the maximum AC amperes of the installed system and XXX is the maximum short circuit current that can be delivered through that

device - usually the available utility system short circuit current at that location, or, only if noted on the drawings, the maximum short circuit current that the PV system can provide (from all strings in parallel).

F Provide a placard at each main panel or switchboard with the following information in 1/4" High lettering per NEC 690.54: "Caution - Possible Backfeed From Photovoltaic Power System - 480V, XX Amps", where XX is the maximum AC amperes of the installed system.

G Provide a placard on each PV System Inverter with the following information in 1/4" high lettering: "Photovoltaic Power Source Inverter Rating - Operating Current: XX Amps; Operating voltage: XXX VDC; Maximum System Voltage: 600 VDC; Short-Circuit Current: XXXX Amps", where XX is the maximum DC amperes of the installed system, XXX is the operating voltage DC, and XXXX is the short circuit current that the Inverter can provide (from all strings in parallel).

H Provide utility-required system directory placard and utility safety switch identification placard as required by local utility company, to identify all system components.

3.2 UTILITY INTERCONNECTION

A The PV generation system shall not be interconnected with the Utility's distribution facilities until written authorization from the Utility Company has been obtained. Unauthorized interconnections may result in injury to persons and damage to equipment or property for which the installing contractor and Owner may be liable.

3.3 INSTALLATION STANDARDS

A System Installation shall conform to the equipment manufacturers Installation Manual(s) and requirements or guidelines.

B All Local, State, and NEC codes shall be observed, including all industry standards related to the installation, operation, and maintenance of photovoltaic power systems.

3.4 TESTING

A Photovoltaic modules shall be tested in the factory for design performance and results shall be included in the Operation and Maintenance manuals.

B Inverters shall be factory tested for performance and the results shall be included in the Operation and Maintenance manuals.

C System testing of the installed photovoltaic array shall be performed on all system strings and recorded in the Operation and Maintenance manuals.

D Megger test each roof array prior to energizing to establish that no shorts or ground exist at any point on the arrays.

E Testing to be performed per CPUC Electric Rule 21 testing procedures and requirements. All testing to be done on "no-cloud" days to avoid system fluctuation by passing clouds. Installer to provide all testing and certification / commissioning.

F System start-up procedure will be as outlined by the Manufacturer's Installation Manual and the Inverter Manual.

* * *

STANDBY EMERGENCY ELECTRIC GENERATORS — SECTION 26 32 00

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide two complete integrated Standby Emergency Generators plus accessories assembly, as noted herein and as indicated on the Drawings. Two emergency generators are required one for the new Fire Station Number 5 and one for Temporary Fire Station Number 5.

B. For CBC compliance, the Standby Generator supports critical equipment with an importance factor of 1.5. Provide Special Seismic Certification documentation as per CBC and ASCE/SEI requirements for all generator and associated equipment defined as 'critical' with an importance factor of 1.5, as per Paragraph 1.10 of Section 26 05 00 – Basic Electrical Requirements.

C. The Manufacturer shall provide certification by an approved agency that the Standby Generator assembly, including all components, base fuel tank, vibration isolators, enclosure, mounting, and anchorage is CBC compliant. Manufacturer shall be responsible for providing a complete assembly of all components in one overall housing which is certified to comply as an integrated assembly with CBC requirements. Overall dimensions of the generator with housing shall not exceed area allotted on drawings, including all access clearances.

D. Seismic installation of Standby Generator package: Based on Manufacturer's approved submittal, Contractor shall retain the services of a State of California registered Structural Engineer to prepare final installation details and drawings for equipment supports and attachments.

1. Submit drawings of the equipment showing dimensions, support equipment, connections, and the proper anchorage locations.
2. Equipment weight and weight distribution (e.g., center of gravity in elevation and plan).
3. Seismic Vibration Isolation Devices: Manufacturer's product information indicating class and type. Indicate load ratings as published manufacturer's data or shop drawings. Indicate proper orientation of devices on plan.
4. Specific details of restraints including anchor bolts and welds and maximum load at each location.

E. Manufacturer shall provide technical assistance to Owner in securing all required local Air Quality Management District permits for installation of the Standby Emergency Generator.

F. The Contractor shall include a Manufacturer-provided three-year engine-generator maintenance agreement as described herein as part of the bid. The maintenance agreement shall include, as an option, an annual 2-hour 1.0 pf full-load test with a portable load-bank provided by the Manufacturer.

1.2 SUBMITTALS FOR ESCH GENERATOR

A. Refer to Section 26 05 00 – Basic Electrical Requirements for procedure.

B. Tests and Reports (Test Requirements are detailed in Paragraph 1.4).

1. Provide certified test reports of the following:
   a. Factory tests.
   b. Field Tests: Test reports shall include dates performed, method of testing, test results, test interpretation and recommended action.

C. Shop Drawings and Product Data

1. The following list includes the required Shop Drawing information that shall be submitted for the generator:
   a. Physical dimensions and weights.
   b. CBC Certificate of Compliance for all components and overall assembly.
   c. Brake horsepower of engine.
   d. Fuel consumption.
   e. Cooling requirements.
   f. Noise db level. Provide details of acoustical housing and factory testing to prove acoustical housing performance.

g. Electrical characteristics of generator, voltage regulator, and battery charger.
h. Load graphs.
i. Control panel.
j. Elevation.
k. Remote Annunciator
l. Wiring and control diagrams.
m. Engine and generator details, including governor and base day tank.
n. Location of available parts and service.
o. Confirmation that engine meets the latest EPA Tier Exhaust Emission Compliance Statement, complies with latest CARB standards for emergency standby equipment, and complies with the local Air Quality Management District requirements.
p. Details of base-mounted day tank.
q. Certification that Generator Set is in compliance with California Fire Code Chapters 27, 34, & 312, and NFPA Chapter 30.

D. Maintenance and operating instruction manuals, six bound copies, including approved shop Drawings, parts list, list of recommended spare parts, sources of purchase and similar information.

1.3 GUARANTEE

A. Provide a written guarantee against all defects in materials and application, which prevent proper functioning for one (1) year from date of acceptance of the project.

1.4 TESTS

A. Certified copies of factory test giving guaranteed performance characteristics to meet the Specifications should be furnished by the Manufacturer. The unit shall be tested at the Manufacturer's plant for performance of all functions including a 2-hour full load test, using 0.8pf reactive to 1.0pf resistive load banks and until all temperatures have been stabilized for at least 30 minutes.

B. The Manufacturer shall have field tests made of the generator and wiring systems in place by a qualified factory technician. The complete engine generator set with all of its appurtenances shall be tested after installation for all functions, including a 2-hour full load test with full-rated resistive (1.0pf) load bank. The Manufacturer shall supply all equipment necessary for the tests.

1.5 FUNCTION

A. The emergency generator shall function to start automatically immediately upon power failure of the normal power supply, assume full load within ten (10) seconds and automatically switch into the emergency power system. The unit shall be automatically removed from the line upon resumption of normal power and stopped five (5) minutes later.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. Provide and install two complete emergency power systems, including power plant powered by diesel engine driven generator and operated by means of a signal from the building automatic transfer switch. Each system shall be complete, tested and meet all the functional requirements of a fully automatic emergency power source serving full load power stabilized at rated voltage and frequency within three seconds after normal power source failure.
2. The diesel engine generating sets shall be fully automatic and shall be complete with starting and control equipment, critical grade muffler, skid-mounted batteries, charger, acoustical enclosure, remote annunciator, and other equipment necessary to provide a complete, fully automatic system. The generator at new Fire Station 5 shall be provided with a base-mounted day tank. The generator at the Temporary Fire Station shall be provided with a base mounted tank with 48 hours of fuel storage.
3. Arrange for the services of a factory erection engineer for checking installation, making specified and all other necessary tests, making initial start, instructing operating

personnel in operating unit through all of its functions to ensure that the unit is performing in accordance with the intentions of the Specifications.

4. Manufacturers: Cummins-Onan, Generac, Kohler, or approved equal.

B. Power Plant:
   1. Rating shall be based on continuous standby power rating of the generator and with capabilities to carry 100% full load without damage to the engine, generator or components, and with capabilities for starting the largest motor scheduled for the standby power system while carrying full connected load at an altitude of 350 feet above sea level. Full load power ratings shall be in KW (rating as indicated on the drawings) continuous standby at 0.8 PF at 120/208 V 3PH 4W at Fire Station 5 and 120/240 V SINGLE PHASE, 3 WIRE at the Temporary Fire Station.
      a. Voltage regulation shall be +/-0.5% for any constant load between no load and rated load.
      b. Frequency regulation shall be isochronous from steady state no load to steady state rated load.
      c. The diesel engine generator set shall be capable of single step load pick up of 100% nameplate KW and power factor, less applicable de-rating factors, with the engine-generator set at rated operating temperature.
      d. Under motor starting conditions the generator set shall be capable of sustaining a minimum of 90% of rated no load voltage with the specified KVA load at near zero power factor applied to the generator set.
      e. Maximum transient voltage dip shall not exceed 35 percent below rated on application of the single largest surge load step.
   2. Provide unit and all accessories in a common acoustical enclosure, with a common base for unit capable of skidding into place. Unless otherwise noted on the drawings, all accessories, including muffler and base-mounted day tank, shall be concealed within common generator enclosure. Provide sound absorbing enclosure to produce overall sound rating noted below.
   3. Provide minimum 18" flexible section in all electrical, fuel and exhaust lines at connection to power plant.
   4. Provide flexible steel disc coupling to engine-generator.
   5. Provide lifting brackets.
   6. Provide a CBC compliant and certified vibration isolation system. The vibration isolation system shall be designed to withstand the seismic forces from ground motions and installation shall comply with critical equipment (importance factor = 1.5) requirements. CBC conforming vibration isolators shall be provided and installed at the bolt-down locations between the skid and the concrete mounting pad.

C. Engine:
   1. The engine shall be 4-cycle design, water-cooled; series turbo charged with after cool, having no inherent unbalanced reciprocating forces. Operating speed shall be 1800 RPM.
   2. Starting by battery-driven starter. Include cranking sequencer, which shall give three (3) start attempts before locking out over-cranking protection.
   3. Governor shall be isochronous electronic as required to maintain generated frequency at 60 Hz. at 75% full load within a steady state band-width of (+/-) 0.25%. Frequency shall not vary over 3% from no load to full load. Governors using engine crankcase lube oil will not be acceptable. Governor shall be type EFC, Electronic Isochronous.
   4. Provide fuel and lubrication systems for diesel engine, complete with replacement element type air cleaner; primary and secondary fuel filter and oil filter; full pressure lubrication system with positive displacement lube oil pump and spring-loaded bypass valve; lube oil cooler; engine driven fuel transfer pump; base-mounted day tank, sight gauge, automatic float switch to maintain fuel level, and high-fuel and low-fuel alarm dry contacts for local and remote indication. Provide day tank rupture basin contacts (2 sets) for local and remote alarm.

5. Provide a cooling system with sufficient capacity for cooling engine when generator is delivering 100% full load for four hours at ambient of 40 degrees C at an altitude of 350 feet. Include water-circulating pump and thermostatic valve to maintain recommended engine temperature; radiator with drain and air vent and fan with protective guard; jacket water corrosion resistant heating elements (1 unit at 1800W 208V – Contractor shall field re-wire as necessary for 208V1PH connection). Radiator shall be filled with antifreeze solution of strength as recommended by Manufacturer. Exhaust air shall be discharged vertically, using a scoop design.
6. The exhaust system shall consist of a silencer meeting the requirement of no more that 70 dBA at 7 meters from the exhaust point of the silencer (this does not take into account the run of the exhaust beyond normal exhaust locations). All areas within 24 inches of the silencer shall be covered with 6 lb. density mineral wool. All piping shall be schedule 40 black pipe.
   a. The exhaust system, silencer, piping, and insulation shall be factory supplied and installed. Extend black standard weight iron pipe from the engine with 18" flexible connection between engine and muffler. The exhaust muffler shall be critical grade, of 3-chamber construction with high degree silencing materials and shall be unit installed. Unless otherwise noted on drawings, provide silencer mounting within housing, and tail pipe with rain cap.
   b. The manufacturer is to verify that the back pressure of the exhaust piping in the conditions shown on the drawings does not exceed manufacturer's requirements.
7. Provide a unit-mounted battery for engine start, 24-volt DC with a capacity of not less than 160-ampere hours at 20-hour rate. The battery shall also be sized for six starts of 30-second cranking duration each, with ambient 15 degree F, mounted on earthquake-proof tray on pad with all necessary battery cables, hydrometer and enclosure-mounted voltage-regulated battery charger in Nema 3 enclosure with float, taper, and equalize charge settings and with DC voltmeter, DC ammeter and circuit for low voltage alarm. Battery shall be lead-acid type.
8. Auxiliary switches for over-speed trip and automatic over-speed shut down at a speed 10% greater than the normal specified operating RPM. The engine shall shut down on over-speed, low oil pressure, high oil temperature and high water temperature by means of auxiliary switches, actuating signal lights and alarms.
9. Temporary batteries may be used for testing, but new, unused batteries shall be furnished after final testing is complete and before acceptance. New batteries shall be used for one generator start to demonstrate adequacy of final battery installation.
10. Engine exhaust emissions shall meet the latest adapted EPA Tier Exhaust Emission Compliance Statement, the latest CARB requirements for emergency standby applications, and the local Air Quality Management District standards.

D. Generator:
1. 120/208-volt, 3-phase, 60 Hz., 4-wire rated at 0.8 power factor continuous standby service, complying with NEMA standards.
2. Brushless, balanced 4-pole revolving field type with rotating rectifier exciter mounted on end of shaft, single ball bearing support to starter housing, rotor connected by semi-flexible steel disc coupling to engine flywheel to assure permanent alignment free of injurious tensional vibrations at speeds up to 125% of synchronous. Rated for 105 degrees Centigrade rise.
3. Generator insulation shall be in accordance with latest NEMA standards using minimum Class H materials. All insulation system components shall meet NEMA MG1 temperature rise limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 105 degrees centigrade.
4. A permanent magnet generator (PMG) shall provide excitation power for immunity to voltage distortion caused by non-linear loads. The PMG shall sustain excitation power for optimum motor starting and to sustain short circuit current at approximately 300% of rated current for not more than 10 seconds.

5. Voltage regulator of static solid state design to give (+/-) 2% regulation from no-load to full load; instantaneous voltage dip less than 20% of rated when full load at rated power factor suddenly applied; and recovery to stable operation of voltage within 1% of rated within four seconds. The voltage regulator shall be of the asynchronous pulse width modulated type and shall be insensitive to severe load-induced waveshape distortion from SCR or thyristor circuits such as those used in UPS and motor speed control equipment. Manual adjustment of (+/-) 5% of normal to be included by a lockable device or screwdriver slot in rheostat shaft. All voltage sensing shall be 3-phase.
   a. The automatic voltage regulator shall be temperature compensated, solid-state design. The voltage regulator shall control build up of AC generator voltage to provide a linear rise and limit overshoot. The regulator shall include a torque-matching characteristic, which shall use differential rate of frequency change compensation to use the maximum available engine torque and provide optimal transient load response. Regulators, which use a straight line fixed volts per hertz characteristic, are not acceptable.
6. Shielding of generator, exciter and regulator to prevent radio frequency interference.
7. The generator, exciter, and voltage regulator shall be designed and manufactured by the engine-generator set manufacturer so that the characteristics shall be matched to the torque wave of the engine to provide the fastest possible system recovery from transient load changes and to prevent engine stall during transient overload conditions.

E. Control Equipment:
1. Panel mounted with vibration isolators to plant frame. Top of panel shall not exceed 6'-0" above concrete pad.
2. The generator set shall be provided with a microprocessor-based control system, which shall be designed, to provide automatic starting, monitoring and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set and remote monitoring and control as described in this Specification. The control panel shall be mounted on the generator set.
3. The control panel shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.
4. The control panel shall be UL508 labeled, CSA282-M1989 certified and meet IEC8528 part 4. All switches, lamps and meters shall be oil-tight and dust-tight and the enclosure door shall be gasket. There shall be no exposed points in the control panel (with the door open) that operate in excess of 50 volts. The controls shall met or exceed the requirements of Mil-Std 461C part 9 and IEC Std 801.2, 801.3 and 801.5 for susceptibility, conducted and radiated electromagnetic emissions. The entire control shall be tested and meet the requirements of IEEE587 for voltage surge resistance.
5. The generator set mounted control panel shall include the following features and functions:
   a. Three position control switch labeled RUN/OFF/AUTO: In the RUN position the generator set shall automatically start and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage
   b. Red "mushroom-head" push-button EMERGENCY STOP switch: Depressing the emergency stop switch shall cause the generator set to immediately shut down and be locked out from automatic restarting.
   c. Push-button RESET switch: The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
   d. Push-button PANEL LAMP switch: Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed or after the switch is depressed a second time.
   e. Generator Set Metering: The generator set shall be provided with a metering set with the following features and functions:

f. 2.5-inch, 90-degree scale analog voltmeter, ammeter, frequency meter and kilowatt (KW) meter. These meters shall be provided with a phase select switch and an indicating lamp for upper and lower scale on the meters. Ammeter and KW meter scales shall be color coded in the following fashion: readings from 0-90% of generator set standby rating: green; readings from 90-100% of standby rating: amber; readings in excess of 100%: red.
   1) Digital metering set, 0.5% accuracy, RMS type to indicate generator voltage, frequency, output current, output KW, KW-hours and power factor. Generator output voltage shall be available in line-to-line neutral voltages and shall display all three-phase voltages (line to neutral or line to line) simultaneously.

g. Generator Set Alarm and Status Indication: The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status and existing alarm and shutdown conditions. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on a digital display panel.
   1) Low oil pressure (alarm)
   2) Low oil pressure (shutdown)
   3) Oil pressure sender failure (alarm)
   4) Low engine temperature (alarm)
   5) High engine temperature (alarm)
   6) High engine temperature (shutdown)
   7) Engine temperature sender failure (alarm)
   8) Low coolant level (alarm or shutdown--selectable)
   9) Fail to crank (shutdown)
   10) Over-crank (shutdown)
   11) Over-speed (shutdown)
   12) Low DC voltage (alarm)
   13) High DC voltage (alarm)
   14) Weak battery (alarm)
   15) Low fuel-Base tank (alarm)
   16) High AC voltage (shutdown)
   17) Low AC voltage (shutdown)
   18) Under frequency (shutdown)
   19) Over current (warning)
   20) Over current (shutdown)
   21) Short circuit (shutdown)
   22) Ground fault (alarm)
   23) Under frequency (alarm)

h. In addition, provisions shall be made for indication of two customer-specified alarm or shutdown conditions. The non-automatic indicating lamp shall be red and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

i. Engine Status Information: The following information shall be available from a digital status panel on the generator set control:
   1) Engine oil pressure (psi or kPA)
   2) Engine coolant temperature (degrees F or C; both left and right bank temperature shall be indicated on V-block engines)
   3) Engine oil temperature (degrees F or C)
   4) Engine speed (rpm)
   5) Number of hours of operation (hours)
   6) Number of start attempts
   7) Battery voltage (DC volts)

j. The Generator Control Panel shall monitor the status of each Automatic Transfer Switch connected to the generator. The monitoring for the Automatic Transfer Switch shall be:
   1) ATS Normal Position
   2) ATS Emergency Position

k. The ATS status shall also be displayed on the Generator Remote Annunciator.

6. Control Functions: The control system provided shall also include a cycle cranking system, which allows for user selected crank time, rest time and number of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each with 15-second rest periods between cranking periods.
7. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode the alternator excitation system shall be disabled.
8. The control system shall include an engine governor control which functions to provide steady state frequency regulation as noted elsewhere in this Specification. The governor control shall include adjustments for gain; damping and a ramping function to control engine speed and limit exhaust smoke while the unit is starting. The governor control shall be suitable for use in paralleling applications without component changes.
9. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
10. The control system shall include sender failure monitoring logic, which is capable of discriminating between failed senders or wiring components and an actual failure conditions.

F. Remote Indicator Panels: Provide quantity one (1) remote annunciator panel at each project site. The panels shall be flush-mountable with micarta label reading "Engine Operator Conditions," and with the following devices:
1. Green pilot light with engraving to indicate "ENGINE RUNNING."
2. One audible alarm with silencing switch to indicate engine start failure for any of the following reasons:
   a. High water temperature.
   b. Low oil pressure.
   c. Over-speed.
   d. Over-crank.
   e. Low battery voltage.
   f. Low-level fuel alarm.
3. Remote indicator panel shall include an amber light indication for each of the following:
   a. Control switch not in auto position.
   b. Low water temperature.
   c. ATS in normal position.
   d. ATS in emergency position.
4. Each of the functions listed previously in Paragraphs 2. (a) through (f) shall be indicated by a separate red warning light and each warning light shall be so engraved.

G. Fuel System: The fuel system shall conform to NFPA 30 and 37. The fuel system shall be complete and shall consist of a dual filtering system, and engine fuel pump. The engine shall start, operate, and stop on DF-2 fuel.
1. Fuel Filtering System: The fuel filtering system shall consist of a strainer, located between the storage tank and the fuel transfer pump, and a duplex fuel filter, located between the engine fuel pump and the engine. The filtering system shall be capable of removing from the fuel system flakes, dirt, metallic chips, carbon, water, or other foreign matter, which would be harmful to the engine. The filtering system shall be easily accessible for quick-and-easy replacement of the filter element and cleaning of the strainer. Components of the filtering system shall be the standard products of the engine Manufacturer.
2. Engine Fuel Pump: The engine fuel pump shall be a positive-displacement, engine-driven pump capable of supplying an adequate quantity of fuel to the engine under all

operational conditions. Solenoid shut-off valve in fuel line discharge side of pump shall be interlocked with the emergency engine shutdown circuitry.

3. Fuel Transfer Pump: The fuel transfer pump shall be a dual motor driven dual pump system mounted on or adjacent to the day tank for transfer for fuel from the separately-mounted tank to the day tank.
4. Fuel Tank: The fuel tank shall be a separately-mounted Supervault tank provided and installed under another Division of the Specifications.
5. Fire Station 5 Day Tank: A 30-gallon day tank shall be provided with the engine-generator package, skid mounted under the engine, and shall be capable of providing an immediate fuel supply to the engine fuel pump. The tank shall be provided with a flexible tubing suction line to the engine, an excess fuel return line from the engine to the tank, a fuel gauge, a vent, a drainpipe, and high and low-level float switches for activating the low-level alarms. The tank shall be a full double wall, U.L. listed design and shall be factory tested in accordance with the requirements of U.L. 142. The outer containment cavity shall be equipped with an emergency leak-detection float switch for the leak detection and alarm system.
6. Temporary Fire Station 5 Base Tank: A fuel tank shall be provided with the engine-generator package, skid mounted under the engine, and shall be capable of providing an immediate fuel supply to the engine fuel pump. The tank shall be provided with a flexible tubing suction line to the engine, an excess fuel return line from the engine to the tank, a fuel gauge, a vent, a drainpipe, and high and low-level float switches for activating the low-level alarms. The tank shall be a full double wall, U.L. listed design and shall be factory tested in accordance with the requirements of U.L. 142. The outer containment cavity shall be equipped with an emergency leak-detection float switch for the leak detection and alarm system. The tank shall have capacity to provide 48 hours of fuel back up.
7. The tank shall include labels to indicate "Diesel Fuel". The lettering shall be 3" high, half-inch stroke, red letters on a white background outlined in red.
8. All of the above items shall be submitted for approval. Do not release the fuel tank for manufacture until it has been approved.

H. Output Circuit Breaker:
1. Provide engine-generator mounted circuit breaker, rating as noted on the Drawings.
2. Breaker handle shall not exceed 6'-6" above grade when engine-generator is mounted to a 6 inch high structural isolation pad.

I. Protective Sound Attenuated Enclosure:
1. The generator set and accessories shall be completely housed in a weather protective and sound attenuated enclosure. The enclosure shall have a cambered roof to prevent rain accumulation, shall include stainless steel hardware to prohibit rust, and shall include stainless steel retainers to hold doors securely in place. The enclosure sound level shall be 70dBA at 23 feet. The generator set, enclosure, and sub-base day tank shall be U.L 2200 listed as a package
2. Material used for the enclosure shall 14 gauge steel for panels and 12 gauge steel for posts. Hinged lockable access doors shall be provided on each side, with hold-open retainers as indicated in Paragraph 1 above. Non-hygroscopic sound insulating materials shall be provided on the interior walls. Rodent barriers shall be provided on inlet and outlet sides. Louvers shall be fixed. The enclosure shall include the sub-base day tank. Oil and coolant drains shall be run to the exterior of the enclosure. Interior valves on the oil and coolant lines shall be provided for ease of service.
3. Unless otherwise shown on drawings, the enclosure shall completely house the muffler on the generator set.
4. Provide sheet metal scoop on radiator output, to direct the radiator exhaust air directly up and vertically out of the generator enclosure. Insure that scoop provides adequate airflow under the conditions at the location of the generator. Provide screen on output of scoop to prevent dirt, leaves, and bird incursions. Provide drain on floor of scoop to drain off any water. Provide access door in scoop for cleaning of any accumulated

debris. Scoop shall be factory-mounted as part of the engine-generator package. Provide detailed shop drawings of scoop with engine-generator submittals.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The engine-generator set shall be mounted on a rigid steel chassis suitable for installation on seismic isolators.

B. Coordinate locations with the Owner.

C. The Contractor shall assist the Owner in preparing and submitting a permit-to-construct application to the local Air Quality Management District for installation of the engine-generator. Granting of such permit will require a site-specific screening application followed by an analysis by the local Air Quality Management District. If the local Air Quality Management District analysis concludes that a diesel particulate filtering (DPF) system will be required for this site, the Manufacturer shall provide to the Owner a proposal for any and all modifications to the engine-generator unit that will be required to meet the local Air Quality Management District requirements. If a DPF is required, it shall be certified and labeled as IBC compliant for critical equipment, and shall be included in one overall housing with the other engine-generator components. The Manufacturer shall include with its proposal IBC re-certification of the overall assembly by analysis to include the DPF. Proposal shall include delivery and costs for all modifications.

D. Load tests shall be run as required in Paragraph 1.4 of this Section to the generator rated load after generator installation is complete. The Manufacturer for full-load testing of the generator shall provide auxiliary load banks. Manufacturer shall schedule the tests with the Owner so that final tests may be witnessed. Verify correct reading and operation of all meters, indicators and controls.

E. Readings required during both preliminary and final tests requested in Paragraph 1.4 shall be taken and shall include the following:
   1. Frequency.
   2. Voltage.
   3. Current.
   4. Wattage.
   5. Ambient temperature.
   6. Water temperature.
   7. Oil pressure and temperature.

F. Protection: Provide protection facilities and procedures to prevent damage and deterioration.

G. Verify utility phase rotation prior to connection of the Generator to the Building Distribution System. Modify the Generator output phase rotation to match the Utility Company.

H. The Manufacturer shall perform all required testing of the fuel day tank at the site after the installation is complete, but before the fuel is delivered. Tests shall include verification of correct operation of the leak detection system.

3.2 INSTRUCTION AND MAINTENANCE

A. Instruct the Owner's personnel in the proper use, operation and maintenance of the set. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in the procedures to be followed, checking for the source of an operational failure or malfunction.

B. Maintenance Period: Starting at the date of acceptance of the Work, provide complete systematic inspection and maintenance for the first three years. Furnish trained experts and equipment to check, adjust, lubricate and otherwise maintain the generator set in operation without defects or deterioration. Replace or repair materials and parts, which become defective or deteriorated for any reason.

C. Furnish a factory-trained Engineer for a minimum of one working day prior to final acceptance of the generator installation, or as needed to satisfy Owner that the system is functioning properly. Testing and training for the new engine-generator installation will take place at non-standard times. Training and testing will take place on weekends, and could be scheduled on

holidays and in the middle of the night, at the discretion of the Owner. Provisions shall be made in the bidding for this contract for such scheduling requirements.

D. Provide 3 year Manufacturer maintenance Contract, for the new engine-generator installation. **This shall include two site visits per year and annual portable load-bank testing as specified in Paragraph 1.1 of this Section.**

* * *

AUTOMATIC TRANSFER SWITCHES SECTION 26 36 23

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide automatic transfer switches (ATS) as indicated on the Drawings and as specified herein. Two automatic transfer switches are required, one for Fire Station Number 5 and one for Temporary Fire Station Number 5.

B. For CBC compliance, each ATS shall be considered critical equipment with an importance factor of 1.5. Provide Special Seismic Certification documentation as per CBC and ASCE/SEI requirements for all equipment defined as 'critical' with an importance factor of 1.5, as per Paragraph 1.10 of Section 26 05 00 – Basic Electrical Requirements.

C. The Manufacturer shall provide certification by an approved agency that the ATS, including all components, enclosure, mounting, and attachment is CBC compliant.

D. Seismic installation of ATS: Based on Manufacturer's approved submittal, Contractor shall retain the services of a State of California registered Structural Engineer to prepare final installation details and drawings for equipment supports and attachments.

1.2 SUBMITTALS

A. Refer to Section 26 05 00 – Basic Electrical Requirements for procedure.

B. Shop Drawings and Product Data, including complete wiring diagrams, including system interconnections.

C. Test and Test Report for the Automatic Transfer Switch:

1. Visual and Mechanical Inspection:
   a. Inspect for physical damage.
   b. Compare equipment nameplate information and connections with single line diagram and report any discrepancies.
   c. Check switch to ensure positive interlock between normal and alternate sources.
   d. Check tightness of all cable connections and bus joints.
   e. Perform manual transfer operations.
2. Electrical Tests for each Automatic Transfer Switch:
   a. Perform insulation resistance tests phase-to-phase and phase-to-ground with switch in both source positions.
   b. Set and calibrate in accordance with the Manufacturer's recommendations.
      (1) Voltage-sensing relays.
      (2) Transfer time delay relays.
      (3) Engine shutdown relays.
   c. Perform automatic transfer by:
      (1) Simulating loss of normal power.
      (2) Return to normal power.
   d. Monitor and verify correct operation and timing:
      (1) Normal voltage-sensing relays.
      (2) Engine start sequence.
      (3) Time delay upon transfer.
      (4) Alternate voltage-sensing relays.
      (5) Automatic transfer operation.
      (6) Interlocks and limit switch function.
      (7) Timing delay and retransfer upon normal power restoration.
      (8) Engine shutdown feature.
      (9) Correct functioning of auto-exercising controller.

D. Maintenance and operating instruction manuals. Submit five bound copies including approved Shop Drawings, parts list, list of recommended spare parts, sources of purchase and similar information.

E. CBC Seismic Certificate of Compliance.

1.3 REFERENCE STANDARDS

A. The following Specifications and standards, except as hereinafter modified, are incorporated herein by reference and form a part of this Specification to extend the indicated by the references thereto. Except where specific date is given, issue in effect (including amendments, addenda, revisions, supplements, and errata) on the bid date shall be applicable. In text such Specifications and standards are referred to by basic designation only.

B. National Fire Protection Association (NFPA)
No. 70 National Electrical Code (NEC)

C. Underwriters' Laboratories, Inc. (UL):
No. 1008 Automatic Transfer Switches
No. 489 Molded Case Circuit Breakers

D. National Electrical Manufacturers Association (NEMA):
ICS 2.447 Industrial Control and Systems

E. American National Standards Institute (ANSI):
V37-90a Guide for Surge Withstand Capability (SWC) Tests

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Onan
ASCO
Russelectric
Zenith
Kohler

2.2 AUTOMATIC TRANSFER SWITCHES, GENERAL

A. Each ATS shall be rated as noted on the Drawings. Complete transfer switch shall be listed and labeled under UL-1008 as a device for use on emergency generator systems. ATS shall be mounted in a Nema 1 enclosure at Fire Station Number 5 and in a Nema 3R enclosure at Temporary Fire Station Number 5. Each ATS shall be the standard product of a company engaged in manufacturing automatic transfer switches for at least 2 years. ATS shall be manufactured so that no rear or side access is required. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2.3 CONSTRUCTION AND PERFORMANCE FOR EACH ATS

A. Transfer Switch shall consist of a completely enclosed with a separate control logic panel. The contact assemblies shall be operated by a stored energy mechanism, and be energized only momentarily during transfer providing inherently double throw switching action. Control power for all transfer operations shall be derived from the line side of the source to which the load is being transferred.

B. Transfer Switch shall be positively interlocked mechanically and electrically to prevent simultaneous closing of both sources under either automatic or manual operation. A neutral position shall not be possible under normal electrical operation except that the switch shall be provided with a Delayed Transition accessory for switching highly inductive loads. Transfer Switch shall have a manual neutral position for load circuit maintenance. A Transfer Switch position indicator shall be visible from the front of the switch to show to which source the transfer switch is connected.

C. Transfer switch shall be capable of being operated manually under full load conditions. Manual operation shall be accomplished via integrally mounted pushbutton operators located on the face of the contact assemblies. Removable manual operation handles and handles which will move in the event the electrical operator becomes energized while performing a manual transfer operation are not acceptable. The manual operator shall provide the same contact-to-contact transfer time as provided under normal automatic operation to prevent possible flashovers from switching the main contacts slowly. In addition, provisions shall be provided to allow disengagement of the electrical operator during manual operation.

D. A solid state sensing and control logic panel shall be separately mounted from the power-switching portion of the Transfer Switch. The two Sections shall be connected together by control cables with plug-in connectors. The control Section shall be capable of being disconnected from the power Section for maintenance purposes.

E. The logic circuit shall utilize differential sensing solid-state components mounted on printed circuit boards to accomplish proper operation and to perform functions such as timing and voltage and frequency monitoring. LED's on each PC card shall indicate the proper operation of each function furnished. Construction shall be such that functions cards are individually replaceable without requiring replacement of the complete solid-state package. Cars for plug-in modifications shall be available for field installation with retention of the UL label.

2.4 SEQUENCE OF OPERATION

A. Upon reduction of phase-to-phase voltage of the normal source to 80% of nominal, and after a time delay of 1-90 seconds (adjustable to meet field conditions) to override momentary dips and/or outages, the auxiliary engine start contacts shall close to initiate starting of the Emergency Generator.

B. After the Generator has reached 90% of nominal voltage and frequency, and after a time delay (see Drawings for the Time Delay Setting for each ATS), the ATS shall transfer the load to the Generator. Provide an under-voltage / under-frequency monitor for the Emergency/Standby Source.

C. When the Normal Source has been restored to 90% of rated voltage, and after a time delay adjustable from 0.5-30 minutes (to insure the integrity of the Normal Power Source), the load shall be retransferred to the Normal Source. Refer to the Drawings for the Time Delay Setting for each ATS.

D. A time delay module shall be provided in ATS, adjustable 0.5-30 minutes, to delay shutdown of the Emergency/Standby Power Source after retransfers to allow the generator to run unloaded for cool-down.

E. If the Emergency Generator should fail while carrying the load, transfer to the Normal Power supply shall be made instantaneously upon restoration of the Normal Source to satisfactory conditions.

F. ATS shall be provided with a Delayed Transition timer, adjustable 0-120 seconds. The ATS shall pause during transfer with both sources disconnected from the load, to allow back-EMF from large inductive loads to decay. Methods, which use relative phase-angle differences to control transfer, are not acceptable.

G. ATS shall be provided with 4 sets of Auxiliary Contacts to indicate 'Normal' or 'Emergency' Position of the ATS.

2.5 ADDITIONAL ACCESSORIES/SPARE PARTS

A. Provide an engine exercise timer in the Automatic Transfer Switch, which shall automatically start the engine periodically. Timer shall be digital, with lithium battery back up. Provide a selector switch to select exercise with load transfer or without load transfer. The timer shall include a failsafe circuit, such that if the engine fails during exercise the ATS will immediately retransfer to the Normal source.

B. Provide pilot lights to indicate to which source the load is connected, and to indicate the availability of each power source.

C. The transfer switch shall be rated for the short circuit currents noted on the Drawings, or a minimum of 65,000AIC, to be verified as part of the short-circuit study see Section 26 24 00.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Section 26 05 00 – Basic Electrical Requirements for details of Work under this Section, including seismic installation requirements.

B. Testing: See Sections 26 32 00 - Standby Emergency Electric Generator and 26 08 00 - Testing.

* * *

TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS) SECTION 26 43 00

PART 1- GENERAL

1.1 WORK INCLUDED

A. The Basic Electrical Requirements, Section 26 05 00 – Basic Electrical Requirements are part of this Section, and the contract for this work, and apply to this Section as fully as if repeated herein.

B. This specification describes the mechanical and electrical requirements for a transient voltage surge suppressor and noise filter herein known and shown on all drawings as TVSS. The TVSS shall be suitable for application in category C3, B3/C1, and B3 environments (see Part 2 of this Section for specific application) as described in ANSI/IEEE C62.41. The TVSS shall be of parallel design and provide surge protection in all modes as well as electrical high frequency noise filtering for high exposure locations as defined in ANSI/IEEE C62.41-1991.

C. The unit shall be UL 1449 Listed as a Transient Voltage Surge Suppressor and UL 1283 Listed as an Electromagnetic Interference Filter.

1.2 SUBMITTALS

A. Comply with the general contract requirements.

B. Submit all related TVSS specifications, electrical and mechanical drawings, maintenance manuals and U.L. 1449 surge suppression ratings for the TVSS.

C. Equipment Manual: Furnish with the submittal and with each unit delivered an equipment manual (3 copies) that details the installation, operation and maintenance instructions for the specified unit.

D. Drawings: Electrical and mechanical drawings (3 copies) shall be provided with the submittal and with each unit delivered that show unit dimensions, weights, mounting provisions, connection details and layout diagram of the unit.

E. UL 1449 Listing/Clamp Voltages: Manufacturer shall provide data showing UL 1449 product listing. Manufacturer shall also submit certified documentation of applicable Location Category Testing in full compliance with Nema LS 1-1992, paragraphs 2.2.10 and 3.10.

F. Single Pulse Surge Current Capacity Testing: Certified documentation of the unit's Single Pulse Surge Current Capacity Testing shall be included in the submittal.

G. Minimum Repetitive Surge Current Capacity Testing: Certified documentation of the unit's Minimum Repetitive Surge Current Capacity Testing shall be included in the submittal.

H. Spare Parts: A list of customer-replaceable spare parts shall be included in the submittal and with each unit delivered. All spare parts shall be quickly and easily field-replaceable.

I. Diagnostic Signature Card: Each TVSS unit shall include a Diagnostic Signature Card listing factory-established benchmark suppression voltage values for all modes of protection. The suppression voltage values shall be established during final production line testing utilizing a DTS-2 Diagnostic Test Set. This Diagnostic Signature Card shall provide space for subsequent field-testing allowing comparison of the initial factory benchmark testing with subsequent field-testing suppression voltage values.

1.3 QUALITY ASSURANCE

A. Manufacturers Qualifications: Firms regularly engaged in the manufacture of TVSS products for categories C3, B3/C1, and B3 (ANSI/IEEE C62.41) and whose products have been in satisfactory service for not less than 2 years. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

1.4 CODES AND STANDARDS

A. UL compliance and labeling: Listed per UL 1449 and UL 1283.

B. ANSI/IEEE compliance: Comply with ANSI/IEEE C62.41 (Categories C3, B3/C1 and B3 as applicable - see Part 2 of this Section) and C62.45.

C. NEC compliance: Comply with NEC as applicable to construction and Article 280 for installation.

D. National Electrical Manufacturers Association (NEMA LS1-1992)

E. The TVSS shall be capable of surviving 1000 sequential Category C3, B3/C1, or B3 surges

(as applicable - see Part 2 of this Section) without failure. Follow IEEE test procedures established in C62.45.

PART 2 -PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. List of Equipment Manufacturers:
Transient Voltage Surge Suppression
Current Technology
Liebert
L.E.A. Dynatech

B. Surge Suppressor shall be Current Technology or approved equal with options as listed in paragraph 2.02-L below:
1. Switchboards, Distribution Panels and other distribution equipment rated 800A or less with no upstream TVSS protection (Category B3/C1):
a. 200,000A Single Surge Current Capacity (L-N / L-G / N-G / L-L)
b. Type TG200-120/208V-3GY-DM-L2 for 120/208V systems.
2. Switchboards, Distribution Panels and other distribution equipment rated 800A or less with upstream TVSS protection (Category B3):
a. 150,000A Single Surge Current Capacity (L-N / L-G / N-G / L-L)
b. Type TG150-120/208-3GY-DM-L1 for 120/208V systems.
3. Branch Circuit Panelboards with up-stream TVSS protection (Category B3):
a. 80,000A Single Surge Current Capacity (L-N / L-G / N-G / L-L)
b. Type TG80-120/208V-3GY-DM-L1 for 120/208V systems.
4. Branch Circuit Panelboards with integral TVSS protection (Category B3):
a. 80,000A Single Surge Current Capacity (L-N / L-G / N-G / L-L)
b. Type EGPE2-80-120/208V-3GY WYE for 120/208V systems

2.2 TVSS GENERAL

A. The TVSS maximum continuous operating voltage (MCOV) shall be capable of sustaining 115% of the nominal rms voltage continuously without degradation. All suppression filter systems maximum continuous operating voltages shall be in compliance with test and evaluation procedures outlined in NEMA LS 1-1992.

B. Operating frequency range shall be 47 to 63 Hertz.

C. Protection Modes. All protected modes shall be as defined per NEMA LS 1-1992, paragraph 2.2.7. TVSS shall provide protection in all modes, including Line-to-Neutral, Line-to-Ground, Line-to-Line and Neutral-to-Ground protection.

D. The rated single pulse surge current capacity for each mode of protection of the unit shall be as indicated in Paragraph 2.01.B of this Section.

E. In compliance with NEMA LS 1-1992, suppression filter systems shall be single pulse surge current tested in all modes at surge currents up to 150% of the product design rating by an industry-recognized independent test laboratory. The test shall include an ANSI/IEEE C62.41-1991 Category C1 surge defined as a 1.2 X 50 □sec, 6000V open circuit voltage waveform and an 8 X 20 □sec, 3000A short circuit current waveform to benchmark the unit's suppression voltage, followed by a single pulse surge of maximum rated surge current magnitude with an approximated 8 X 20 □sec waveform. To complete the test, another Category C1 surge shall be applied to verify the unit's survival. Survival is achieved if the suppression voltage measured from the two category C1 surges does not vary by more than 10%. Test results shall be submitted.

F. Per ANSI/IEEE C62.41 and ANSI/IEEE C62.45-1992, all suppression filter systems shall be repetitive surge current capacity tested in every mode utilizing a 1.2 x 50 □sec, 20 KV open circuit voltage, 8 x 20 □sec, 10 KA short circuit current Category C3 bi-wave at one minute intervals without suffering either performance degradation or more than 10% deviation of clamping voltage at a specified surge current. Test results shall be submitted.

G. Suppression filter systems EMI-RFI noise rejection or attenuation values shall be in compliance with test and evaluation procedures outlined in NEMA LS-1-1992.

Attenuation Frequency	100KHz	1MHz	10MHz	100MHz
Insertion loss (ratio)	50-1	350-1	500-1	250-1
Insertion loss (dB)	34	51	54	48

H. TVSS systems clamping voltages shall be in compliance with test and evaluation procedures outlined in NEMA LS 1-1992. Maximum clamping voltages shall be as follows:

System Voltage	Mode	A3 Ringwave	B3 Ringwave	B3/C1 Comb. Wave	C3 Comb Wave
120/240	L-N	250	305	410	775
120/208	L-G	355	420	410	775
	N-G	220	290	380	550
	L-L	440	540	750	1400

I. The unit shall be installed with coordinated UL 489 or UL 198 listed or recognized overcurrent protection devices.

J. The TVSS shall have a response time no greater than .5 nanoseconds, for any of the individual protection modes.

K. The TVSS shall use LED indicators, which provide indication of suppression failure as well as optically isolated N.C dry contacts for remote monitoring.

L. TVSS Product Characteristics:

1. TVSS Units for connections to equipment rated 1600A and above: The TVSS shall include an engineered solid-state high performance suppression system utilizing a predetermined number of selenium cells and arrays of non-linear voltage dependent metal oxide varistors with similar operating characteristics. The suppression system shall not utilize gas tubes, spark gaps, and silicon avalanche diodes. The suppression system shall not incorporate non-field replaceable components, which may degrade performance or long-term reliability of the suppression system.
2. TVSS Units for connections to switchboards and panels rated 1200A and below: The TVSS shall include an engineered solid-state high performance suppression system utilizing arrays of non-linear voltage dependent metal oxide varistors. The suppression system shall not utilize gas tubes, spark gaps, and silicon avalanche diodes. The suppression system shall not incorporate non-field replaceable components, which may degrade performance or long-term reliability of the suppression system.
3. Each TVSS shall include a high frequency extended range power filter and shall be UL 1283 listed as an Electromagnetic Interference Filter. The filter shall reduce fast rise-time, high frequency, error-producing transients and electrical line noise to harmless levels, thus eliminating disturbances, which may lead to electronic system upset. The filter shall provide minimum noise attenuation values as specified in Paragraph 2.02.G of this Section.
4. All internal wiring associated with the suppression filter system and subject to surge currents shall utilize low-impedance copper bus bar. All internal connections associated with the suppression filter system and subject to surge currents shall be made with compression or mechanical solderless-type lugs and shall be bolted to the bus bars in order to reduce overall system impedance. No plug-in component modules, quick-disconnect terminals, non-field replaceable fusing or printed circuit boards shall be used in surge current-carrying paths.
5. The unit shall include long-life, solid state, externally visible status indicators that monitor the on-line status of each phase of the unit.

6. The unit shall incorporate an integral test point allowing easy off-line diagnostic testing verifying the operational integrity of the unit's suppression filter system. Field-testing shall permit proactive testing to ensure performance and long-term reliability. Testing shall include injection of an impulse into the off-line suppression filter system to verify the suppression performance values established at final factory testing and recorded on the Diagnostic Signature Card. Indicator lights monitoring fuse condition or power available which inform the user of failure after the fact do not meet the intent of this specification.
7. The TVSS shall include an integral non-fused safety interlocked disconnect switch with an externally mounted manual operator.
8. The TVSS shall include a battery-powered audible alarm that detects and provides notification of any single or multiple phase failure of the suppression filter system. The unit shall also include a status indicator for each phase that extinguishes to indicate a failure mode and an LED that flashes to indicate any alarm condition. The alarm shall have a silence switch and a test switch for ensuring positive function and shall have an alarm disable LED that illuminates when the alarm is disabled. The monitoring unit shall have an easily replaceable, commonly available battery for backup to ensure audible alarm function in the event of a total power failure. The unit shall have a battery backup monitor light, which shall illuminate when the battery requires replacement. To monitor on-line status, the monitoring package shall also include two sets of form C dry contacts (N.O. or N.C.) to facilitate connection to remote monitoring facilities. The contacts shall be normally open or normally closed and shall change state upon the failure of the suppression system or power loss in any combination of all three phases.

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to Section 26 05 00 – Basic Electrical Requirements for details of work under this section.

3.2 TESTING

A. Upon completion of installation, a factory-certified local service technician shall provide testing services. The following tests shall be performed:
   1. Voltage measurements from Line-to-Ground, Line-to-Neutral, Line-to-Line and Neutral-to-Ground at the time of the testing procedure.
   2. Impulse injection to verify the system suppression voltage tolerances for all suppression paths. Impulse testing shall be completed while the unit is off-line to isolate the unit from the distribution system.

B. Test results shall be recorded and compared to factory benchmark test parameters supplied with each individual unit. A copy of the start-up test results and the factory benchmark testing results shall be supplied to the engineer and the owner for confirmation of proper suppression filter system function. In addition, the integrity of the neutral-ground bond shall be verified through testing and visual inspection.

3.3 GUARANTEE

A. The manufacturer shall provide a 5-year warranty from date of installation against failure of each TVSS unit.

* * *

LIGHTING SECTION 26 51 01

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Light fixtures. Refer to the Lighting Fixture Schedules, and provide a complete and working Building Lighting System. Catalog numbers in the fixture schedule are basic fixture types.
   1. Additional features, accessories and options herein specified, described, scheduled, or as required by conditions in the field, are to be included for all fixtures provided.
   2. Provide 'Unistrut' channel mounting armatures and stainless steel aircraft cable suspension kits for all suspended linear fluorescent continuous-row luminaire assemblies in the Apparatus Bays, as detailed on the Drawings.

B. Lamps. Provide all lamps for all fixtures of size and type as recommended by the fixture manufacturer and as scheduled, or specified herein.

C. Ballasts, including standard and dimmed fluorescent, H.I.D., and solid-state drivers for L.E.D.'s.

D. Lighting controls, including small packaged, microprocessor-based programmable multi-scene wallbox-type dimmers, line voltage wall switches, motion sensors, automatic contactor-based systems tied to incoming Station Alerts, contactor-based 'scene' control via remote wall switches, and automatic Daylight Dimming Systems at selected areas.

E. Exit and Emergency Egress lighting where indicated and where required by Code, including L.E.D. Exit Sign luminaire, and egress pathway lighting supplied by normally-switched building luminaires connected to the Building Emergency Electrical Distribution System on generator backup, augmented by emergency lighting inverter.

F. Supports for outlet boxes and fixtures, including seismic restraint slack wires for recessed fixtures in suspended ceilings per code and backing in walls as required keeping fixtures secure and level.

G. All required standard and non-standard mounting hardware for luminaires, including support brackets, bars, backing plates and blocking in ceilings and walls; Contractor shall order recessed fixtures with special, extra-deep trim collars where ceiling/soffit material depths warrant them.

H. Special suspended and cantilever arm supported mounting armatures for long linear fluorescent luminaire runs at Apparatus Bay and Basement Parking Garage Entry Drive areas, fabricated from 'Unistrut' Channel assemblies, as detailed on the Drawings.

I. Provide CBC 2010 compliant seismic installation of all equipment and fixtures as per Paragraph 1.10 of Section 26 05 00 - Basic Electrical Requirements.

J. All lighting must be accessible for maintenance or repair by 8 foot ladder in interior of facility, except in Apparatus Bay areas and open Stairs and Stairwells.

1.2 INCORPORATED DOCUMENTS

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

B. Section 26 05 00 – Basic Electrical Requirements and 26 27 00 – Basic Electrical Requirements and Methods apply to all work in this section.

C. Painting Finishes Division: Painting and Finishes (cutting of holes in finished surfaces for recessed lighting fixtures), painting of surface custom luminaire mounting brackets, Unistrut mounting channels, and miscellaneous exposed raceways, outlet boxes, luminaire mounting and/or connection hardware, etc., to match adjacent surfaces, as directed by the Architect.

1.3 RELATED WORK

A. Ceiling Access panels where required for access to equipment, outlets, back-up batteries, remote ballasts, L.E.D. power supplies and transformers, etc., located above suspended ceilings, sheet rock or plaster ceilings. Coordinate with the Architect and other trades.

1.4 SUBMITTALS

A. Submit under provisions of Section 26 05 00 – Basic Electrical Requirements.

B. The Contractor shall furnish (6) six sets of submittals for review by the project team unless otherwise noted in these specifications. The submittals shall include the following information:
   1. Product Index: The following information shall be included in the product index.
      a. Fixture Type. The index shall call out each luminaire type per the fixture schedule in the Contract Documents.
      b. Manufacturer's Catalog Number. Outstanding information required to make a complete catalog number shall be clearly identified in the index.
      c. Where a pole is included with the luminaire, include the catalog number of the pole in addition to that of the luminaire.
      d. Lamp Data. Provide the Manufacturer's name and Catalog Number for each lamp including wattage, color temperature, and color rendering index.
      e. Comments. The index shall include a column for comments. The comments column shall include extraneous information required for clarity.
   2. Manufacturer's literature for every fixture listed on the Fixture Schedule.
      a. Catalog Information:
         (1). Luminaire Data Sheet: The manufacturer's cut sheet shall include the following:
            (a). Photometric: Candlepower distribution curve or table with horizontal readings at 0, 22.5, 45, and 90 degrees and vertical readings from 0 to 180 degrees in 5 degree increments in accordance with the Illuminating Engineering Society published test procedures.
            (b). Catalog Number Nomenclature
            (c). Coefficient of Utilization Tables
            (d). Luminaire Line Drawing
            (e). Ballast (each type)
   3. Data sheets for electronic ballasts. Indicate fixture types on applicable ballast data sheets.
   4. Data sheets for wallbox controls and other products specified in this section.
   5. Shop Drawings:
      a. Provide shop drawings of suspension details for fixtures recessed in, mounted on, or suspended from hung ceilings. Details shall clearly illustrate proposed methods for supporting fixtures independent of the suspended ceiling system.
      b. Detailed, dimensioned, scaled shop drawings of all cove mounted fluorescent luminaires containing the following information:
         (1). Exact field measured length (clear inside dimension) of cove or pocket.
         (2). Exact fixture length and arrangement of lamps, i.e., placement of lamps on the fixture channel.

c. Detailed, dimensioned, scaled shop drawings of suspended luminaires constructed with linear metal housings containing the following information.
   (1). Support mechanism, including aircraft cable suspension kits, including decorative canopies.
   (2). Trim details.
   (3). Closure piece details.
   (4). Pattern configurations.

d. Detailed, dimensioned, scaled shop drawings of Contractor-provided special 'Unistrut' channel mounting armatures for long runs of linear fluorescent units arranged in continuous rows – both aircraft cable suspended and cantilever bracket-arm supported types called for on the Drawings, at the Apparatus Bay and Basement Parking Garage Entry Drive Areas, containing the following information.
   (1). Support mechanisms, including stainless steel aircraft cable suspension assemblies.
   (2). Custom-fabricated steel cantilever bracket arms.
   (3). Connection provisions and hardware, including connection junction boxes, conduit, cords, etc.
   (4). Dimensioned Plans for each individual luminaire run.

6. Samples:
   a. Provide samples of fixture trim where "Finish as selected by Architect" is indicated on the Fixture Schedule. Submit two finish samples, 75 mm x 75 mm (3" x 3") minimum, of all custom color; decorative metal, or anodized aluminum finishes. Samples must be approved in writing by the Architect prior to ordering.

7. Schedule of spare lamps.
   a. Provide a schedule indicating the type and quantity of spare lamps to be provided to the Client at project closeout. Refer to Section 26 51 01, Article 3.5.G for specific lamp information.

C. For Any Fixtures Substituted For Those Specified:
   1. Independent Testing Laboratories, Inc., or equal, photometric test report for each Luminaire type and lamp combination listed on the Fixture Schedule. Test reports shall be based on Illuminating Engineering Society published test procedures and shall contain polar coordinate candlepower distribution curves in five lateral planes for fixtures with asymmetric distributions and fixture luminance data for vertical angles above 45 degrees from nadir. Test results shall indicate fixture efficiency for the lamp and aperture assembly specified. Fixtures with efficiencies more than 2% below the values of specified fixtures are not acceptable and will be rejected.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site and store in unopened cartons in protected location. Inspect products immediately and report all damage accordingly.

1.6 GUARANTEE AND WARRANTIES

A. All work performed under this section must be guaranteed to be free of defects in products or workmanship for one year after date of acceptance by Owner, unless noted otherwise in General Conditions.

B. Warranties:
   1. Electronic ballasts must be warranted against failure for five years after date of substantial completion. Warranty includes replacement ballast and $100.00 labor allowance.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide fixtures as indicated in Lighting Fixture Schedule; if conflict exists between Lighting Fixture Schedule and Specifications, the more stringent requirement shall take precedence.

B. Provide lighting fixtures new and complete with mounting accessories, junction boxes, trims, and lamps.

C. Provide products with UL labels appropriate to intended installation conditions, or with labels from other testing laboratories whose results are acceptable to local inspector, showing compliance with UL standards. Labels must be concealed from normal viewing angles.

D. All products of same type by same manufacturer.

2.2 FIXTURE CONSTRUCTION

A. Sheet metal: materials and thickness shall be 20-gauge (0.7 mm or 0.027") min., free of dents, scratches, oilcan, or other defects.

B. Painted fixtures: exposed weld marks, joints, and seams shall be filled and sanded smooth before finishing.

C. All edges cleaned and dressed to remove sharp edges or burrs.

D. Extrusions: 1/10" min. wall thickness, smooth and free of tooling lines, with cast end plates that exactly match extrusion profiles.

E. Castings: smooth, free of pits, scales, gate marks, or blemishes.

F. Spinnings shall have 1/32" min. thickness, smooth, free of spinning lines or blowback, with clean edges.

G. Welds: Follow recommendations of American Welding Society. All welds continuous and free of spatter, residue, or warping.

H. No light leaks visible in finished room. Ensure that downlight housings mounted in wood slat ceilings are not visible from below. Field paint exterior of housing with high temperature paint if necessary.

I. Exposed end plates and joiners, with concealed fasteners.

J. End-to-end mounted fixtures: Verify row configurations and provide joiners, aligning splines, and trims to suit.

K. Hardware:
1. Steel or aluminum interior fixtures: cadmium-plated hardware.
2. Steel or aluminum exterior fixtures: stainless steel hardware.
3. Stainless steel fixtures: stainless steel hardware.
4. Copper alloy fixtures: brass hardware.

L. Raceways: Where used for through wiring, fixtures must be approved for use as raceways.

2.3 RECESSED FIXTURES

A. Point-source fixtures: provide pre-wired junction box and thermal protection, and provide slack wires to structure at two diagonal corners. Order fixtures to be mounted in non-standard thickness ceilings and/or soffits with optional, extra-deep trims.

B. Troffer fixtures: provide hold-down clip at each fixture corner, and slack wires to structure at two diagonal corners or as detailed on the drawings. The detail will take precedence.

C. Verify ceiling construction details and provide fixture housings and trims to suit.

D. Non-accessible ceilings: Provide access to junction boxes, ballasts, transformers, and battery packs through fixture apertures; no access panels in ceiling.

E. Mounting frames: To prevent rusting, provide galvanized steel or cast aluminum frames for installation in damp locations or in plaster ceilings.

F. Adjustable fixtures shall be provided with rotation and tilt locking devices.

2.4 PENDANTS

A. Cable-suspended: 3/16"-diameter aircraft-grade stainless steel braided suspension cable with 1/4 x 20 chrome-plated stainless steel threaded coupler at top of linear fixtures, with fully adjustable stainless steel coupler, with knurled finish, at fixture housing(s), to permit min. 45-degree swing in any direction away from vertical. Flat canopy with drilled, grommet opening for power cord exit at power drop points, to permit splice inspection after installation.

B. Stem-mounted: 16 mm (5/8") maximum o.d. stem with ball swivels at top (and bottom of linear fixtures) to permit 45-degree swing in any direction away from vertical. Flat canopy to permit splice inspection after installation.

1. Provide internal safety cable from fixture body to stud in outlet box.

C. Supports: Carry fixture weight to structure and provide horizontal bracing from suspension points to ceiling framing to prevent sideways shifting. Provide diagonal seismic restraint wires per code. Refer to Fixture Mounting Details on Drawings.

D. Provide and install decorative stainless steel aircraft cable 'ties', including chrome -plated or stainless steel hardware & fittings, to prevent sway of suspended fixtures wherever obstructions (ducts, pipes, walls, other fixtures, etc.) prevent free sway of 45 degrees in all directions. Refer to details on Plans, where shown.

E. Pendants & suspension cables must permit +/- 13 mm (1/2") threaded vertical adjustment after installation, leaving at least 6 mm (1/4") thread contact at all points.

F. Verify mounting heights for each fixture and coordinate stem/cable and feed lengths with manufacturer prior to ordering fixtures.

2.5 TRIMS

A. Trims must fit tightly and be held in by gravity, spring clips, or mechanical fasteners. Trims must not drop out under normal conditions or seismic forces which do not exceed the design criteria of the building.

B. Aluminum parabolic cones shall be smooth, properly shaped, with Alzak finish in colors as indicated.

1. No hot spots or lamp images visible at angles shallower than lamp shielding angle.
2. Self-flange cones must bend parallel to ceiling and cover ceiling hole without additional trim ring. Unpainted flange shall have the same finish as cone interior.
3. Cones and louvers for fluorescent fixtures must have permanent anti-iridescence treatment.

C. Lenses, diffusers, and patterned glass: glass or virgin acrylic as noted, with patterns as noted.
1. Finished thickness 2 mm (1/10") min. unless noted otherwise.
2. Linear runs over 1200 mm (4'-0") long shall be in equal-length pieces.
3. Lenses for tungsten halogen fixtures shall be tempered borosilicate glass.
4. Lamp enclosures for metal halide lamps shall be glass or acrylic and must be capable of retaining lamp fragments in the event of non-passive lamp failure.
5. Glass UV filters for individual accent light fixtures, where indicated, shall be 3 mm (1/8") borosilicate glass filters with dichroic coating, 2% maximum light transmission @ 400nm, 80% min. transmission @ >425nm, Bausch & Lomb "Optivex" or equal by Balzers.
6. Acceptable Manufacturers:
   a. Plastic lenses and diffusers: ALP, ICI/KSH & Haas.
   b. Glass lenses and patterned glass: Balzers, Bausch & Lomb, Gray.

2.6 FINISHES

A. Steel Reflectors: Unless otherwise specified, the reflector surface finish shall be of synthetic white enamel or polyester powder coating. Finish shall show no indication of chipping, cracking, flaking or any other sign of loss of adhesion. The initial reflection factor shall be not less than 88 percent averaging 5 randomly selected points on the reflector. After 100 hours of exposure to the radiation of a glass enclosed carbon arc lamp, such as a Fade-O-Meters, the reflectance of the exposed portion shall not be less than 5 percent and finish shall show no appreciable color change. The carbon arc lamp shall be operated at appreciable color change. The carbon arc lamp shall be operated at 13 plus or minus 0.5 amperes at 140 volts. The reflector shall be placed ten inches from the arc and the lamp so ventilated that the temperature of the exposed portion does not exceed 105 degrees F.

B. Aluminum Reflectors: Reflecting surfaces shall be provided with either a specular or diffuse finish as indicated. Reflection factors shall be not less than 83 percent for specular reflecting surfaces. Each reflecting surface shall be protected by dense coating of oxide weighing not less than 5.0 milligrams per square inch, applied by an anodic process. The reflector shall be given a sealing treatment that will prevent staining of the reflecting surface when subjected to a stain test. All aluminum reflectors & louvers shall be a low iridescent equivalent to that provided by Coil Anodizers.

C. Non-Reflecting Surfaces: Unless otherwise specified, the finish on all non-reflecting exterior surfaces shall be aluminum oxide or aluminum; white, gray or aluminum paint on steel; nickel or chromium plating on copper alloy. Fastening devices shall be nickel, chromium, cadmium or zinc plated. All painted surfaces shall be free of tears, star marks, blisters, pinholes, chipping and any other defects that may impair appearance or serviceability.

2.7 LAMPS

A. Unless otherwise noted, lamps described in the Lighting Fixture Schedule and in these Specifications shall be manufactured by General Electric, Osram/Sylvania, North American Philips, Venture, or approved equal.

B. Each type of lamp by only one manufacturer to maintain color consistency.

C. Re-lamp fluorescent or HID fixtures at no cost to owner if lamps exhibit excessive lamp to lamp color variation or burn out within 90 days of substantial completion date.

D. Fluorescent:
1. Long fluorescent lamps shall either be 265ma full wattage, T8; 3000 deg. K color temperature; min. CRI 82; 4ft. lamps or, 170ma full wattage for standard output T5 lamps, and 460ma full wattage for high output T5 lamps, 3000 deg. K color temperature; min. CRI 85; 4ft lamps only. Provide TCLP compliant reduced mercury content lamps whenever such lamps are available.
2. Compact fluorescent lamps shall be 3000 deg. K color temperature, min. CRI 82, and triple-tube as noted or as required for each fixture. Provide TCLP compliant reduced mercury content lamps whenever such lamps are available.
3. Long compact fluorescent (Biax) lamps shall be 3000 deg. K color temperature, min. CRI 82, twin tube, single ended 4-pin. Provide TCLP compliant reduced mercury content lamps whenever such lamps are available.
4. L.E.D. lamps shall be 3000 deg. K color temperature, min. CRI 80.
5. "Burn-in" all fluorescent lamps on dimmed circuits for at least 100hrs. prior to dimming.

E. High Intensity Discharge Lamps:
1. High Intensity Discharge Lamps: clear, coated or diffuse, as noted, 3000 deg. K color temperature unless otherwise noted. HID lamps installed in open bottom downlight fixtures shall be self-extinguishing types wherein current to the arc tube is interrupted in the event that the lamp envelope is broken.
2. Metal Halide:
   a. Provide color corrected "Mastercolor" type lamps for all metal halide lamps less than 200 watts.

2.8 LAMPHOLDERS

A. Incandescent and HID shall be porcelain, size to accommodate specified lamps.

B. Fluorescent lampholders shall have plastic bodies with copper contacts. For horizontally mounted lamps over 8" long, provide additional plastic clip to support glass end of lamp.
1. Provide rapid start lampholders in fixtures for all dimmed linear fluorescent lamps.

C. High Intensity Discharge:
1. Verify lamp mounting orientations and provide position-oriented lampholders where required to suit specified lamps.
2. Low-wattage metal halide lampholders: rated for 6,000V starting pulse.
3. Acceptable manufacturers: Bryant, Kulka, and Leviton.

2.9 BALLASTS AND TRANSFORMERS

A. General:
1. Verify input voltages and match to branch circuit voltages.
2. Provide ballasts with best-made sound ratings for each type and mount securely to prevent vibration.
   a. Replace excessively noisy ballasts or transformers at no cost to Owner.
3. Remote ballasts or transformers: Provide suitable enclosures and mounting hardware, and install in accessible, ventilated locations.
   a. Secondary wiring: provide number and size of conductors as required, with 3% maximum voltage drop between transformer and last lamp.
   b. Keep ballasts or transformers at least 300 mm (12") apart and do not stack vertically.
4. Ballasts must contain no PCB's and be labeled accordingly.

B. Fluorescent Ballasts:
   1. Ballasts must meet applicable energy-conservation standards.
   2. Interwiring (for electronic ballasts):
      a. In linear fixtures or continuous rows of individual fixtures, provide tandem wiring to operate each row of lamps independently. Provide three-lamp and four-lamp ballasts where possible, two-lamp ballasts only where needed to finish a row.
      b. In individual one-lamp fixture, provide two-lamp ballasts and master-slave interwiring between pairs of fixtures where possible.
      c. In individual two-lamp fixtures, provide two-lamp ballasts and interwiring between pairs of fixtures to operate one lamp in each fixture on each ballast.
      d. In individual three-lamp or four-lamp fixtures, provide two-lamp ballasts and interwiring between pairs of fixtures to operate all outer lamps independently of all inner lamps.
      e. In master/slave three-lamp or four-lamp fixtures, provide one, two-lamp ballast and one four-lamp ballast and master-slave interwiring between pairs of fixtures with and interwiring between pairs of fixtures to operate all outer lamps independently of all inner lamps.
   3. Electronic ballasts for long fluorescent lamps 97% min. power factor, "A" sound-rated, with UL Class P thermal protection, 85% min. ballast factor with specified types and numbers of lamps. Ballasts must operate specified lamps within lamp manufacturer's specifications and have no effect on rated lamp life when run more than 10 hours per start.
      a. Instant-start operation, with starting voltage and filament current in compliance with ANSI C78-1.
      b. Parallel-wired.
      c. Provide interwiring and number of lamps per ballast as described under "Interwiring" above. Follow manufacturer's recommendations for maximum whip length.
      d. Light variation 10% maximum with +/- 10% input voltage variation.
      e. Electromagnetic radiation must not exceed FCC Part 18 regulations.
      f. Surge and transient protection per IEEE 587, Category A and ANSI C62.1-1984.
      g. End of life protection to guard against lamp delamination.
      h. Harmonic distortion: Total harmonic distortion (ratio of total harmonic RMS current to fundamental RMS current) must be less than 20% or as required to meet local utility requirements, whichever is lower.
   4. Fluorescent Dimming Ballasts shall be Lutron Hi-Lume electronic type, providing 100% - 1% dimming range.
   5. Preheat ballasts for short compact fluorescent lamps shall be electronic where noted, with 95% min. power factor; HPF ballast where electronic type are not specified and where HPF will fit fixture.
   6. Acceptable Manufacturers:
      a. Electronic: EBT, Universal Lighting Technologies, Osram/Sylvania, Advance, General Electric.
      b. Electronic Dimming: Lutron, no substitutions.
      c. Short compact fluorescent: Advance, Robertson, and Universal.
   7. High Intensity Discharge (HID) Ballasts:
      a. High power factor, thermally protected, constant-wattage autotransformer type, with fuses.
      b. Ballasts for interior installation encased and potted.
      c. Acceptable manufacturers: Advance, Jefferson, and Universal.

2.10 EMERGENCY LIGHTING AND EXIT SIGNS

A. Emergency lighting: Provide lighting for paths of egress as required by code.

B. Emergency fixtures supplied by a separate emergency power source.

1. For fixtures supplied by a separate emergency power source, provide "switched" control of the emergency designated fixtures/lamps to allow complete "off" control when required by the user, and "dimming" control of the emergency designated fixtures/lamps to allow full-range automatic dimming controlled by Automatic Daylight Harvesting Control System as called for on the Plans and in the Specficiations. The switched and/or dimmed control shall include an automatic transfer feature to automatically turn "on" to full intensity the emergency designated fixtures/lamps upon the normal source power failure.
2. Automatic transfer function shall be provided using a UL 924 listed relay, LVS Inc. #EPC-U for switched loads and LVS Inc. #EPC-D-U for dimmed loads, or approved equal, suitable for mounting in a standard 4" square j-box (min. 2.5" deep). Transfer relay shall provide automatic diagnostic test feature which shall maintain power to the emergency designated lamps for 15 seconds after the room is switched off via the respective light switch or control relay. Emergency designated lamps shall turn off after the 15 second test period and shall come back on when the control device is turned back on to restore full lighting to the space.
3. Provide (1) transfer module per "switched" zone; refer to Plans for mounting locations.

C. Exit signs shall be back-lit L.E.D., back mounted on walls, or with canopy for end wall or ceiling mounting. No atomic exit signs are permitted.

1. Diecast aluminum housing with finish as specified on Lighting Fixture Schedule.
2. Letters shall be 20mm (3/4") stroke, 150mm (6") high, with factory-screened left or right arrows as required, brightness and evenness of illumination per code, green color.
3. Remote low-level exit signs, where required, shall be die-cast aluminum, 5/8" maximum thickness. Provide custom color finish to match adjacent wall.

2.11 SMALL PACKAGED PROGRAMMABLE DIMMERS

A. ACCEPTABLE MANUFACTURER: Lutron Electronics Co., Inc.
1. Unless otherwise noted, all basic components (Ballasts, Daylight Sensors, IR Receivers, IR Transmitters, Wall Controls and related accessories) shall be provided by one manufacturer.

B. MASTER CONTROL STATIONS:
1. Definitions: A "scene" or "preset" is a specific look or mood created by different lighting zones set at different intensities. A "zone" is either one or more lighting circuits which are controlled together as a group or one or more motor circuits which are controlled together as a group.
2. Control shall provide 4 preset lighting scenes and 'off' for up to 24 control zones. Control shall be capable of storing an additional 12 preset lighting scenes that can be accessed via wallstations and/or control interfaces. Up to 64 zones may be tied together in one system. Preset shall be set via easy-to-use raise/lower switches, one raise and lower switch per zone. The intensity for each zone shall be indicated via an illuminated barograph, one barograph per zone. More than one zone may be proportionately raised or lowered at the same time. Programming of preset scenes shall be accomplished without the use of an 'enter' or 'store' button. Additionally, one or more zones may be temporarily overridden without altering the scene values, which are stored in memory.
3. Lighting levels shall fade smoothly between scenes at time intervals of 0 to 59 seconds or 1 to 60 minutes. The fade time shall be separately selectable for each scene and shall be indicated by a digital display for the current scene. Pressing a scene select button shall illuminate the corresponding scene LED and simultaneously begin changing the barograph levels to reflect the currently selected scene. In the event that a preset scene with a fade time greater than 5 seconds is initially selected from an 'off'

condition, the programmed fade time shall be temporarily overridden, unless otherwise noted, and the lights shall fade up to that scene over a five-second time span.

4. Controls shall incorporate built-in wide-angle infrared receiver, providing control via a separate wireless remote control transmitter from up to 50 feet away.
5. Control shall provide tamperproof protection of scenes using a minimum of four levels of electronic 'lockout' which prevent alterations of scene values stored in memory. Highest level of 'lockout' shall be capable of disabling manual control at the preset control unit.
6. Wallstations and control interfaces shall be capable of recalling preset lighting scenes, which shall be stored in preset control unit(s) and/or slider control(s).
7. Where indicated, control shall be capable of complete setup of all parameters locally, or when used with the appropriate programmer interface, via a compatible PC. Parameters shall include scenes (including both light levels in 1% increments and fade times), load types, low-end trim, tamperproof protection of scenes, and communication between control units (if applicable). Permanent installation of the PC shall not be required unless indicated on the drawings.
8. Mechanical
   a. Faceplate shall attach using no visible means of attachment.
   b. Controls shall be engraved with appropriate zone and/or scene descriptions, furnished to the manufacturer prior to fabrication. Size and style of engraving type shall be determined by the Architect. Any silk-screened borders, logos, graduations, etc., shall use a graphic process that chemically bonds the graphics to the metal faceplate, resisting removal by scratching, cleaning, etc.
   c. Manufacturer shall ensure the following items regarding product color:
   d. Product color matches NEMA standard WD1, Section 2, and the maximum color deviation from this standard shall not exceed □ E=1, CIE L*a*b color space units. For non-NEMA colors, color match coordination shall be provided on request.
   e. Color variation of any control in the same product family shall not exceed E=1, CIE L*a*b color units.
   f. Visible parts shall exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674-89. Manufacturer to submit proof of testing upon request.
   g. Dimmer shall mount individually in standard 2, 3, or 4 gang U.S.
9. Electrical
   a. Control shall provide power failure memory. Should power be interrupted and subsequently returned, the lights shall come back on to the same levels set prior to the power interruption without requiring any actions on the part of the user. Restoration to some other default level is not acceptable, unless specifically noted elsewhere.
   b. Wiring from dimming and switching panel(s) to preset control unit(s) and wallstations and control interfaces shall be low voltage type Class 2 wiring (PELV).
   c. Controls shall provide an immediate, local LED response upon button activation to indicate that a system command action has been requested. LED shall remain lit contingent upon receiving system confirmation of the successful completion of the command.

C. REMOTE SCENE RECALL CONTROL STATIONS:
1. Entry Stations shall be installed in a standard 65 mm (2-1/2")-deep switch box. Stations shall be Lutron 'See-Touch' style with indicator light, finish to match other devices in room. When shown adjacent to other devices, install in same multi-gang box.
2. Wallstation(s) shall mount individually in standard single gang U.S. wallboxes.
3. Wallstation(s) shall have integrated IR receiver for DCS programming from the handheld programming device.
4. Wallstation(s) shall provide an immediate local LED response upon button activation to indicate that a system command has been requested.

5. Four button Wallstation(s) shall be capable of any of the following functions:
   a. Recalling 4 separate Scenes and 'on' or 'off'
   b. Fine-tuning of individual lighting groups
6. Lighting groups shall be capable of over-lapping and operating an individual or multiple fixtures.

2.12 Wallbox Dimmers: Lutron Nova-T series, of size and type appropriate to loads, color finish as selected by Architect. Provide separate neutral conductor from panel to loads on each phase to prevent cross talk between phases.

1. Incandescent:
   a. Rating as required by loads: NT-Series.
2. Fluorescent: Provide dimmers and compatible Lutron Hi-Lume electronic dimming ballasts. Provide one neutral and two hot conductors between dimmer and load.
   a. NTF-103P.

B. Ganging and Labeling:

1. Dimmers and matching switches in same location shall be installed in same gang box.
2. Follow dimmer manufacturer's instructions for gang-box sizes. Do not break off fins on dimmers unless noted otherwise.
   a. 1+1, 4+1, 7+1 installation: to gang an even number of small devices without breaking off fins, provide multi-gang box as indicated (1, 4, or 7 gangs) and provide additional single-gang box at end, with ears of single box 70 mm (2-3/4") o.c. from last set of ears on multi-gang box.
   b. When rows of devices are stacked vertically space rows 230 mm (9") o.c. to allow heat dissipation.
3. Provide Lutron multi-gang plates to cover each group of devices; plates 3-gang and larger shall be custom-engraved to identify loads controlled.
4. Plates with "-NFB" in catalog number with no fins broken.
5. Plates with "-FB" in catalog number: break off all interior fins on devices, but do not break off outside fins at either end of row.
6. Nova-T: install aligning backplate (provided by Lutron with each multi-gang plate) between wall and devices.
7. Labels: text as indicated 3 mm (1/8") high, all capital letters, engraved on device faceplate, filled with black paint and wiped clean.

PART 3 – EXECUTION

3.1 PREPARATION

A. Architectural Reflected Ceiling Plans shall govern exact location and mounting conditions for all fixtures. Subcontractor shall be responsible for coordination of fixture mounting and compatibility with ceiling construction and other trades.

B. Coordinate work with other trades. Location of lighting has priority over location of new framing (except major structural members), ducts, diffusers, sprinklers, speakers, smoke detectors, and other obstructions.

C. If obstructions are encountered which prevent installation of lighting fixtures according to drawings, notify Architect immediately and do not proceed until conflict has been resolved.

D. Coordinate the location of fixtures in mechanical or unfinished spaces. Locations shown on Drawings may be adjusted by the Contractor to suit conditions only with approval by the Architect. Install fixtures to avoid obstructions and maximize light output, 2100 mm (7'-0") min. mounting height.

E. Coordinate the location of any exposed conduit used to feed lighting fixtures with the Architect prior to installation.

3.2 INSTALLATION

A. General:
1. Subcontractor shall be responsible for handling and installation of fixtures including all supports, hangers and hardware necessary for a complete installation. Fixtures shall be clean, plumb, and level in straight lines, without distortion. Lighting fixtures must be installed so they do not shift during relamping or adjustment. Remedy any light leaks, which may develop after installation of recessed or enclosed fixtures.
2. Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.
3. Point-source fixtures shall be located as dimensioned, or in center of tile or on tile joint as drawn; 6 mm (1/4") maximum off-center tolerance.
4. Linear fixtures shall have 3 mm (1/8") maximum horizontal or vertical alignment variation in any 5 m (16-ft.) portion of run.
5. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds. 486 A and B, and the National Electrical Code.
6. Clean lighting fixtures of dirt and construction debris upon completion of installation. Clean fingerprints and smudges from lenses.
7. Remove and replace fixtures that may have been damaged during construction at no additional cost to the Owner.
8. Protect installed fixtures from damage during remainder of construction period.
9. Provide equipment-grounding connections for lighting fixtures as indicated. Tighten connections to comply with tightening torques specified in UL 486 A to assure permanent and effective grounds.
10. Install fixtures, lamps, lenses, etc., after building is enclosed, weather tight and environmental conditions are nominally the same as expected for the complete spaces. All lamps, glassware, reflectors and refractors shall be clean and free of chips, cracks and scratches.
11. Lamps installed for use as temporary lighting prior to approval shall be replaced with new lamps. Replace all burn outs with specified lamp prior to project closeout.
12. All wall mounted fixtures and all ceiling mounted surface fixtures including exit lights shall be fed through a fixture Stud/Hickey/Nipple assembly and with provisions to prevent fixture turning.
13. Installation of exit signs shall be coordinated with other trades to ensure signs are visible as intended.
14. All junction box cover plates for the lighting branch circuit system shall be clearly marked with a permanent ink felt pen identifying the branch circuit and control relay (panel number, circuit number, lighting control cabinet designation and control relay number) contained in the box.

B. Recessed Fixtures:
1. Seismic restraints: Provide and install slack wires and hold-down clips per code.
2. Holes for Recessed Point-Source Fixtures: Cut holes to follow fixture housings exactly so no gaps will be visible after trims are installed.
3. Install bottom of housing aligned with finished ceiling.
4. Keep ceiling insulation at least 75 mm (3") away from fixtures.
5. Vertical-lamp compact fluorescent downlights shall be installed with adjustable lampholders at proper heights for specified lamps.

6. Install trims after painting of spaces. Install trims tightly, with no gaps or light leaks.
7. Where required by code, provide approved enclosures for fixtures in fire-rated ceilings at no additional cost to owner.
8. Wallwashers:
   a. Orient wallwasher housings according to manufacturer's instructions to maximize brightness on the upper portion of the wall.
9. Lamp Orientation:
   a. In situations where fixtures with horizontal lamps are aligned with each other, orient the lamps such that the axes of the lamps are in the same direction.

C. Ceiling-Mounted and Pendant Fixtures:
1. Provide support for outlet boxes and suspension points so fixtures can be installed securely, including seismic supports per code.
   a. Fixture weight less than 25 kg (50 lb.) at each suspension point: hang from strap or stud on outlet box, or at non-feed points, provide 1/4"-20 stud projecting 20 mm (3/4") below ceiling.
   b. Fixture weight 25 kg (50 lb.) or more at each suspension point: hang directly from structure, either independent of outlet box or from stud extending through outlet box to structure.
2. Suspended Fixtures:
   a. Provide horizontal bracing from suspension points to ceiling framing to prevent sideways shifting.
   b. Provide diagonal seismic restraint wires above ceiling per code.
   c. Furnish suspended fixtures with UL Tested, factory-supplied stainless steel aircraft cable assemblies, complete with stainless cable stops, decorative canopies and flexible power connecting cords. Fixtures over 450 mm (18") wide shall be provided with supports at all corners.
   d. Install suspended fixtures and fixture rows plumb and level.
   e. Provide Unistrut channel mounting armatures for all continuous suspended fixture rows in the Apparatus Bay, as described and detailed on the Drawings.
   f. Verify fixture weights and provide backing in ceilings as required.

D. Wall-Mounted Fixtures:
1. Mounting heights shown on Drawings are measured from finished floor to centerline of outlet box or recessed housing, unless otherwise noted.
2. Verify fixture weights and provide backing in wall as required. Fixtures must not droop or tilt away from wall.
3. Provide custom cantilever bracket arms, fabricated from steel bar stock, and Unistrut channel alignment armatures, at all continuous-row linear fluorescent assemblies as called for on the Drawings.
4. Wet locations: install sealant between fixture and outlet box.
5. In circulation areas, wall-mounted fixtures must not project more than 100 mm (4") from wall if mounted above 685 mm (27") and below 2030 mm (80").

3.3 DELIVERY, STORAGE, & HANDLING:

A. Deliver lighting fixtures in factory-fabricated containers or wrappings, which properly protect fixtures from damage. Inspect lighting fixtures immediately upon delivery to ensure correct shipment without damage.

B. Store lighting fixtures in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity, laid flat and blocked off ground.

C. Handle lighting fixtures carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged units or components; replace with new. Protection wrapping on louvered (parabolic) fixtures shall not be removed until fixtures are ready for operation.

3.4 SEQUENCING AND SCHEDULING:

A. General:
1. Coordinate with other work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of lighting fixtures with other work.
2. Sequence lighting installation with other work to minimize possibility of damage and soiling during remainder of construction.

B. Install controls so all operable parts are at 1200 (48") max. height.

3.5 PROJECT CLOSEOUT

A. Clean fixtures and remove plaster and paint spatters.

B. Clean fingerprints and dust from downlight reflectors. Refer to manufacturer's instructions.

C. Verify that fixtures and controls are working at time of final acceptance by Owner.
1. Relamp as required.

D. Test emergency lighting system for 90 minutes in presence of Owner's representative, check each fixture for proper operation at end of 90-minute test, then recharge for 24 hours and briefly test each fixture again for proper operation.

E. Install and aim adjustable lighting as directed by Architect.
1. Provide personnel, lifts, ladders, and walkie-talkies as required.
2. Aiming will occur at night, outside of normal working hours, at times as approved by the Architect.

F. Spare Lamps:
1. Provide the following spare lamps to the Client for their use after project closeout. Deliver to the jobsite and store lamps as directed by the Client in a clean, dry, and protected environment.
a. All lamp types:
(1). Provide 5% of the total quantity of each individual lamp type on the project - EXCEPT L.E.D.'s.
(2). Provide an additional 5% of the total quantity of each T5 type lamp on the project.

G. Prepare two copies of a Lighting Systems Maintenance Manual consisting of the following in a hardcover binder. Deliver to Architect. After review, Architect will deliver one copy to Owner.
1. One complete set of approved submittals, including product data and shop drawings.
2. List of lamps used in Project, cross-referenced to fixture types, with specific manufacturer's names and ordering codes.
3. Re-lamping instructions for lamps that require special precautions (tungsten halogen, metal halide, etc.).
4. Lighting fixture-cleaning instructions, including chemicals to be used or avoided.
5. Instructions for code-required testing and maintenance of emergency lighting system.

6. Identification of lighting products that contain hazardous materials or that require special disposal techniques (large quantities of fluorescent lamps, etc.)

* End Division 26 *

Division 27 - COMMUNICATIONS

NOT USED

* End Division 27 *

Division 28 – ELECTRONIC SAFETY AND SECURITY

FIRE DETECTION SYSTEM SECTION 28 31 00

PART 1 -GENERAL

1.1 DESCRIPTION:

A These specifications include the furnishing, installation, and connection of the new fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, auxiliary control devices, annunciator, power supplies, and wiring as shown on the drawings and specified herein.

B All work shall comply with Sections 26 05 00 – Basic Electrical Requirements and 26 27 00 – Basic Electrical Materials and Methods.

C Provide CBC compliant seismic installation. Provide Special Seismic Certification documentation as per CBC and ASCE/SEI requirements for all equipment defined as 'critical' with an importance factor of 1.5, as per Paragraph 1.10 of Section 26 05 00 (including all fire alarm equipment in this Section).

D The Manufacturer shall provide certification by an approved agency that all fire alarm equipment, including all components, enclosure, mounting, and attachment is CBC compliant.

E Seismic installation of fire alarm equipment: Based on Manufacturer's approved submittal, Contractor shall retain the services of a State of California registered Structural Engineer to prepare final installation details and drawings for equipment supports and attachments.

1.2 SCOPE:

A This specification outlines the requirements for a microprocessor based, addressable (intelligent) automatic fire detection and alarm system. The system and components shall be supplied by one manufacturer of established reputation and experience who shall have produced similar apparatus for a period of at least two (2) years and who shall be able to refer to similar installations in public buildings rendering satisfactory service. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

B The work described in this specification consists of all labor, materials, equipment and services necessary and required to complete and test the automatic fire detection and alarm system. Any material not specifically mentioned in this specification or not shown on drawings but required for proper performance and operation shall be furnished, installed, and connected complete.

1.3 REQUIREMENTS:

A This installation shall be made in accordance with the drawings, specification and the following:

1 National Electrical Code Article 760
2 NFPA Standard 72
3 Local Codes and Authorities Having Jurisdiction
4 ADA requirements and regulations.

1.4 RELATED WORK:

A Division 26 27 00: Basic electrical materials and methods.
B Mechanical Division: Fire protection systems
C Mechanical Division: HVAC systems
D Mechanical Division: Fire Smoke Dampers

1.5 FIRE DETECTION SYSTEM DESCRIPTION:

A The system shall be a supervised non-coded 24 volt DC, Power Limited system and capable of having all addressable initiation devices in alarm at one time. Initiation and notification device circuits shall be wired Class B. A single ground or open on any initiating device circuit or notification appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

B Provide initiation, notification and other devices as per specifications and indicated on drawings.

C Indicate alarms, supervisory and trouble signals on the fire alarm control panel and the remote annunciator.

D Initiate signals to control HVAC system as per local AHJ requirements or as indicated on drawings.

E Transmit alarm signals to off-site reporting agency via a digital communicator, and dual phone lines.

F For buildings with elevators:

1. Each elevator machine shall be provided with a smoke detector to facilitate elevator recall as outlined below.
2. Each elevator machine room and the top of each elevator shaft shall be provided with a heat detector mounted within 2 feet of any sprinkler head (when sprinklers are provided), to facilitate elevator power shunt trip as outlined below.
3. Each elevator landing shall be provided with a smoke detector to facilitate elevator recall as outlined below.
4. Control modules shall be provided at the elevator machine room to initiate recall and alternate recall functions as outlined below.
5. Control modules shall be provided at any elevator smoke doors to initiate smoke door release upon local landing smoke detector alarm.
6. Activation of any machine room, elevator shaft, or elevator landing smoke detector shall initiate elevator recall functions to the main floor, via a signal to the associated control module. Exception; the main floor elevator landing or machine room detector shall initiate elevator recall to the alternate floor via a signal to the associated control module.
7. Activation of any machine room or shaft heat detector shall initiate elevator main power shunt trip for disconnection of power prior to application of any water onto or into the elevator equipment or shaft, from the sprinkler system.

G The fire alarm system shall function as follows when any smoke or duct detector, water flow switch, manual station or other initiating device operates:

1 Operate required audible/visual and visual devices as shown on the Drawings.
2 Automatically notify off-site reporting agency.
3 Indicate at the control panel alphanumeric display the number and location of the alarmed device.
4 Light an indicating lamp on the smoke detector initiating the alarm.
5 Light an indicating lamp on the remote annunciator indicating the location alarmed as well as the type of device alarmed (area smoke detector, duct detector, manual pull station, water-flow switch, ansul system panel, valve supervisory switch, etc.).

H Provide additional system features and capacities as indicated in Part 2 of this Section of the Specifications.

1.6 GUARANTEE:

A All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance.

1.7 SUBMITTALS:

A Submit fire alarm shop drawings and product data sheets in accordance with Division 1 and Section 26 05 00.

B This Contractor shall submit the completed Fire Alarm Shop Drawings, with associated equipment cut sheets and CSFM listings, to the local Fire Department and submit for a

separate Fire Alarm System Permit as required by the local authority. Final Fire Alarm System approval (by the AHJ) and Permit shall be based on the shop drawings submitted and completed by the Contractor. The design drawings are for overall system requirements and layout only.

C Shop Drawings shall indicate the following: building floor plan, location and type of devices, conduit and wire quantities, power requirements, complete wiring point-to- point diagrams, details, and locations of fire alarm and remote annunciator panels.

D Submit manufacturer's installation instructions including back-box requirements for each piece of equipment.

E Submit manufacturer's operating instructions and maintenance data.

F Submit voltage drop and battery calculations.

G CBC Seismic Certificate of Compliance for all fire alarm equipment.

1.8 APPLICABLE PUBLICATIONS:

The publications listed below form a part of this specification.

A National Fire Protection Association (NFPA) - USA:

No. 70	National Electrical Code (NEC)
No. 72	National Fire Alarm Code
No. 101	Life Safety Code

B Underwriters Laboratories Inc. (UL) - USA:

No. 268	Smoke Detectors for Fire Protective Signaling Systems
No. 864	Control Units for Fire Protective Signaling Systems
No. 268A	Smoke Detectors for Duct Applications
No. 521	Heat Detectors for Fire Protective Signaling Systems
No. 464	Audible Signaling Appliances
No. 1971	Visual Signaling Appliances
No. 38	Manually Actuated Signaling Boxes
No. 346	Waterflow Indicators for Fire Protective Signaling Systems

C Local and State Building Codes.

D All requirements of the Authority Having Jurisdiction (AHJ).

1.9 APPROVALS:

A The control panel and all peripherals shall have proper listing and/or approval from Underwriters Laboratory (UL) and be California State Fire Marshall listed and approved.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL:

A All equipment and components shall be new, and the manufacturer's current model.

B Acceptable System Manufacturers: Notifier, Siemens, Simplex, Firelite, or equal. All equipment and components shall be installed in strict compliance with manufacturers' recommendations.

C All Equipment shall be attached to and ceiling/floor assemblies and shall be held firmly in place. (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2 CONDUIT, BOXES, AND WIRE:

A Conduit: All conduit and wire shall comply with section 26 27 00 of these specifications.

1 Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.

2 Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

3 Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.

4 Conduit shall be 3/4-inch minimum.

B Wire:

1 All fire alarm system wiring shall be new and installed in conduit.

2 Wiring shall be in accordance with local, state and national codes (e.g., NEC Article

760). Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 16 AWG for initiating device circuits and signaling line circuits, and 12 AWG for Notification device circuits.

3 All field wiring shall be completely supervised, Class B, with end-of-line devices located as shown on the riser diagram.

C Terminal Boxes, Junction Boxes and Cabinets:

1 All boxes and cabinets shall be UL listed for their use and purpose.

D The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the power panel as FIRE ALARM and include a breaker handle lock for the dedicated breaker. Fire alarm control panel primary power wiring shall be #12 AWG. The control panel cabinet shall be properly grounded.

2.3 CONTROL PANEL:

A The control panel shall be microprocessor based and totally power limited. The panel shall be capable of supporting Class A (Style 6) or Class B (Style 4) Network Communications lines, and Class A (Style Z) or Class B (Style Y) Notification Circuits. The panel shall have the following features; Totally Field Programmable, Password Access Protection, Built in Panel Diagnostics, Alarm and Trouble Resound, Alarm Event Buffer, Trouble Status Buffer, Point Identification Display, 24 hour Trouble resound, One Man Walk Test, Alarm Verification, and Positive Alarm Sequence. The panel shall have the following relays with a form C configuration, Alarm, Trouble, Supervisory, and Default Alarm Mode (to allow alarm reporting during microprocessor failure).

B The control panel shall be designed to monitor and process a minimum of 198 addressable inputs (smoke detectors, manual stations water flow devices, etc.), and up to 198 addressable monitor or control modules. The Network Communication Lines shall support various annunciation devices (i.e. LED Annunciators, Alphanumeric Displays, Printers) in addition to the addressable inputs and outputs described above. The system architecture shall allow for T-tapping of the Network Communications Lines. The use of a Zone Monitor module on the Communications Line shall further enhance the system with a master/slave concept, of allowing a group of conventional detection devices (standard smoke detectors, manual stations, waterflow and tamper switches) to be interfaced into the system as an address point. The system shall include individual power supply expander panels as required to support the notification loops. Each notification circuit shall be independently field programmable by the use of addressable control modules rated for the required current.

C The control panel shall contain an Alphanumeric Display interface, which contains a microprocessor with a non-volatile memory to store field programmable alarm and trouble messages. The Alphanumeric Display shall consist of two 40-character lines for alarm, supervisory and trouble identification, and in quiescent mode, indicates system status.

D The control panel shall have history reporting, with the history stored in either the alphanumeric or printer modules. The history shall be at least 1,000 events. These events can be alarm, verification, supervisory, trouble, acknowledge, system reset, walk test, and the use of any panel keypad keys and access to any panel modes such as Program or Test.

E The control panel shall have self-diagnosis. Once the program is stored in memory and upon system initiating, if there is a discrepancy between the number of devices entered into the program and the actual number of devices connected to the system, the panel shall annunciate a trouble for the devices in question.

F Power Supply

1 The Power Supply for the Fire Alarm Control Panel may be integral or external to the Fire Alarm Control Panel, and shall provide all control panels and peripheral device power needs. Additional power required to operate all alarm devices (above and beyond the capacity of the main panel supply) shall be provided with power expander panel(s), connected to the alarm output of the main control panel. Provide all required interface modules and relays for proper notification circuit operation as per manufacturers instructions. Expander panel shall be as manufactured by the chosen Fire Alarm System manufacturer (qty. as required for full alarm operation).

2 The power supply shall be designed to meet UL and NFPA requirements for power-

limited operation on all initiating and notification circuits.

3 Positive-temperature-coefficient thermistors, circuit breakers, fuses, or other over-current protection shall be provided on all power outputs.

G Mechanical Design: The control panel shall be housed in a cabinet designed for mounting directly to a wall or vertical surface. The back box and door shall be constructed of .060 steel with provisions for electrical conduit connections into the sides and top. No conduit penetrations shall be utilized on the back or bottom of the panel. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. The cabinet shall be approximately 5 inches deep and 14.5 inches wide. Height shall be approximately 16 inches.

2.4 INITIATION DEVICES:

A The manufacturer of choice, Addressable Photoelectric Smoke detectors, (Intelligent) shall be provided as indicated on the drawings, with features and characteristics as follows:

1 The detector shall be self-compensating for ambient temperature and humidity.

2 The detector shall be addressed, tested and programmed prior to installation using a UL listed programmer/tester. The detector readout shall yield a discrete electrical value for status tracking and logging for determining maintenance and cleaning requirements.

3 The detector shall be suitable for two-wire operation and two way communication on the intelligent analog signaling circuits.

4 The detectors furnished shall be listed for use in environments as covered by Factory Mutual, UL and shall be installed according to the requirements of NFPA 72 for open area coverage.

5 Detectors for magnetic door hold open functions shall be provided with an auxiliary relay base for auxiliary function wiring connections.

a Door holder power shall be routed via the relay base on smoke detectors denoted with an "R" to release the associated doors upon alarm.

B Heat detectors shall be provided as indicated on drawings. Heat detector shall be of the rate compensation type, 135 degree.

C Duct Detectors:

1 Duct detectors, complete with all required sampling tubes and housings, should be provided and connected complete by this contractor, installed by the mechanical contractor. Coordinate with the mechanical contractor.

2 Duct Detectors shall be connected to the air handler starter unit, in order to facilitate unit shutdown upon alarm (via an auxiliary relay in the duct detector). Coordinate exact control wiring with mechanical contractor. Provide and install all required wiring and conduit for starter/duct detector interface.

3 Provide and install power connection to each duct detector as required. Coordinate with mechanical contractor.

4 Provide Nema 3R exterior rated housings for all exterior duct detectors.

D Manual Stations, (Intelligent) shall be single action and semi-flush or surface mounted as indicated on the drawings.

1 The manual station shall be equipped with terminal strip and pressure style screw terminals for the connection of field wiring.

2 The manual stations shall be addressable and identifiable by the master fire alarm control panel when they are resident on the analog loop. Address programming shall be accomplished electronically and reside within the station in non-volatile memory.

E A monitor module Interface device shall be provided for required interface points such as water flow devices and tamper switches, or any contact type devices as indicated on drawings. This Interface device shall have one or two Class B (Style 4) circuits as required.

F Carbon Monoxide Detectors shall be an addressable multi-criteria smoke detector with a separate signal for carbon monoxide (CO) detection per UL 2075 standards (Notifier #FCO-851, or equal).

1 The detector shall be comprised of four sensing elements, including a photoelectric (light-scattering) particulate sensor, an electrochemical CO sensor, a daylight-filtered infrared (IR) sensor and solid state thermal sensor(s) rated at 135°F (57.2°C). The

device shall be able to indicate distinct smoke and heat alarms.

2 Detector shall be furnished with intelligent sounder base which can generate either Temp 3 pattern for fire or a Temp 4 patter for CO alarm indications (Notifier #B200S, or equal)

3 The CO detector component shall be capable of a functional gas test using a canned test agent to test the functionality of the CO sensing cell.

4 The detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms.

5 The detector shall indicate CO cell end of life warning and fault.

2.5 REMOTE ANNUNCIATOR:

A A remote annunciator shall be provided as shown on the plans. The annunciator shall be wall mounted in a multi-gang box or as required. It shall provide a 80 character display to indicate the zone(s) in alarm and LED's for system trouble and supervisory conditions.

2.6 BATTERIES

A Batteries shall be 12 volt, sealed Gell-Cell type, with combined Amp-Hour ratings as required by code.

B Battery shall have a minimum sufficient capacity to power the fire alarm system for not less than twenty-four hours in standby mode, plus 5 minutes of full system alarm upon a normal AC power failure.

C The batteries are to be completely maintenance free, no liquids required. Fluid level checks, refilling, shall not be required. Spills and leakage are not allowed.

2.7 CONTROL DEVICES:

A Control modules shall be provided as indicated on the drawings for fire alarm output functions. These devices shall be connected to the Network Communications Lines, and be field programmable for one of the following options; Remote Relay (form C 1amp 24vdc, 200ma 120vac) with supervised relay operation, Remote Supervised Indicating Appliance Circuit (fused at 1 amp). There shall be an LED on the device that will flash to indicate the unit is being monitored and a steady LED to indicate the unit has been activated. Secondary relays with control power connections shall be provided as required where contact ratings (voltage & amps) so dictate.

2.8 NOTIFICATION DEVICES:

A Horn/Strobe combinations shall be provided as indicated on drawings. The horn / strobe combination shall be Wheelock or equal, ADA and UL 1971 compliant (candela values as required) - White finish.

B Strobe Lights shall be provided as indicated on drawings. The strobe lights shall be wall mounted at +80" AFF or 6" below the ceiling level, whichever is lower, Wheelock or equal, ADA and UL 1971 compliant (candela values as required) - White finish.

2.9 FIRE / SMOKE DAMPERS:

A Fire / Smoke dampers (FSD's) are provided and installed by Division 15. This contractor shall provide and install a 120V power connection to each damper, wired to keep the damper in the open position under normal conditions.

B An integral duct smoke detector will be provided by Division 15. This contractor shall provide and install an addressable monitor module, connected to the alarm contacts on the duct detector, to monitor the condition of the detector and annunciate an alarm condition to the main control panel upon detection of smoke.

C This contractor shall wire the 120V control power for the FSD's via an auxiliary alarm contact in the detector base, to automatically close the damper upon smoke detection. Coordinate all provisions with the mechanical contractor and engineer.

D All FSD provisions shall comply with the applicable sections and requirements of the CBC and the local AHJ.

E Every effort has been made to indicate all required damper locations at rated partitions in coordination with Division 15 work. This contractor shall coordinate with the sub-mechanical contractor to identify all required locations for FSD's and provide connections to all units as required by code. The architectural drawings indicate by symbol, all such rated partitions.

No extra cost shall be approved for additional required connections not shown on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION:

A Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C All fire detection and alarm system devices, control panels and remote annunciator shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D At the final inspection a factory-trained representative of the manufacturer of the major equipment shall perform the tests in Section 3.2 TESTING.

E WIRING:

1 All circuits shall be in conduit, minimum 3/4".

2 Addressable loops circuits shall be two (2) conductor twisted/shielded or wiring approved by the manufacturer. Notification circuits shall be 12 AWG minimum for strobes, but not to exceed manufacturers wire capacity for modules. Control power circuits shall be 14 AWG minimum or as required.

3.2 TESTING:

A Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

1 Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

2 Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

3 Verify activation of all flow switches.

4 Open initiating device circuits and verify that the trouble signal actuates.

5 Open and short all notification appliance circuits and verify that trouble signals actuate.

6 Ground circuits and verify response of trouble signals.

7 Check presence and audibility of tone at all alarm notification devices.

8 Check installation, supervision, and operation.

9 Verify that each initiating device alarm is properly received and processed by the FACP (Walk Test).

10 Conduct tests from the FACP to verify trouble indications for common mode failures, such as alternating current power failure.

B Test reports shall include, but not be limited to:

1 A complete list of equipment installed indicating proper operations as listed above.

3.3 FINAL INSPECTION:

A Final acceptance will require the contractor to deliver to the Owner the following;

1 Three (3) copies of the operating instructions and system maintenance manuals.

2 Three (3) sets of record drawings.

3 Three (3) copies of the final test reports.

4 Three (3) copies indicating the name and phone number of person to contact in the event of equipment failure, and date when system warranty will be terminate.

5 Three (3) sets of data sheets for each piece of equipment supplied.

B The fire alarm system subcontractor or manufacturer shall offer for the owner's consideration at the time of system submittal a priced inspection, maintenance, testing and repair contract in full compliance with the requirements of NFPA 72.

1 The services offered under this contract shall be performed at no charge during the first year after system acceptance and the owner shall have the option of renewing for single or multiple years, up to five years, at the price quoted in bid.

2 The contractor performing the contract services shall be qualified and listed to maintain ongoing certification of the completed system to the UL for specific installed system listing.

3.4 WARRANTY

A The fire detection system shall be warranted for a period of one year from date of acceptance. The warranty shall cover parts, labor, and travel to and from the site.

3.5 INSTRUCTION:

A Provide complete instruction manuals and training to the building personnel. "Hands-on" demonstrations of the operation of all system components and the entire system shall be provided.

* End Division 28 *

Division 29 and 30 - UNASSIGNED

NOT USED

* End Division 30 *

Division 31 - EARTHWORK

EARTHWORK Section 31 20 10

1. GENERAL:

A. SUMMARY: Provide Earthwork, as shown and specified per Contract Documents.

B. REFERENCES:

1. Local Jurisdictions: Perform work in accordance with jurisdictional agency and utility company standards and requirements.
2. American Association of State Highway and Transportation Officials (AASHTO): Standards.
3. American National Standards Institute (ANSI): Standards.
4. American Public Works Association (APWA): Standard Specifications for Public Works Construction.
5. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   b. ASTM D2487: Classification of Soils for Engineering Purposes.
6. State of California, Department of Transportation (CalTrans):
   a. Specifications: CalTRANS Standard Specifications.
   b. Plans: CalTRANS Standard Plans.
7. California Occupational Safety and Health Administration (CalOSHA): Construction Safety Orders.
8. California State Industrial Accident Commission (CSIAC): Trench Construction Safety Orders.
9. U.S. Occupational Safety and Health Administration (OSHA): Standards - 29 CFR, PART 1926 Safety and Health Regulations for Construction, Subpart P - Excavations.
10. Standard Specifications for Public Works Construction, ("Greenbook"), 2012 Edition.
11. City of San Diego Standard Specifications for Public Works Construction, ("Whitebook"), 2012 Edition.

C. SUBMITTALS:

1. General: Submit product data, shop drawings, samples and test reports.
2. Closeout:
   a. As-built Survey:
      1. General: Prepared by registered Land Surveyor. Review and acceptance by City Representative required before placement of landscape backfill materials.
      2. Subgrade Elevations: Show drainage swales with flow line elevations at 25'-0" intervals.

D. QUALITY ASSURANCE:

1. Reference Documents:
   a. Site Data:
      1. Subsurface Investigation:
         (a) General: Soil and subsurface investigations were conducted at the site, the results of which are to be found in the Site Assessment Report issued by Ninyo and Moore Geotechnical and Environmental Sciences Consultants as follows:
         (b) Geotechnical Evaluation Fire Station No. 5 Replacement: 3902 Ninth Avenue, dated March 2, 2013.
         (c) Supplemental Geotechnical Evaluation Fire Station No. 5 Alley Improvements: 3902 Ninth Avenue, dated May 28 2013.
         (d) Temporary Fire Station No. 5: 4075 Park Boulevard, dated June 30, 2014.
      2. Site Survey and Topographic Information: A site survey was made by Rick Engineering Co. and dated November 8, 2011, and is basis for data regarding original surface conditions.
      3. Reference Copies: A copy of the soils report and site survey is available for review at the office of the City Representative.
   b. Interpretation:
      1. General: Site survey and soil investigation data are not part of the Contract Documents; data is only provided for information and the convenience of the Contractor. The Owner and City Representative disclaim any responsibility for the accuracy, true location and extent of investigations prepared by others.
      2. Soils and Subsurface Data: The Owner and the Architect further disclaim responsibility for interpretation of this data by the Contractor, including projections of soil-bearing values, rock profiles, soil stability and the presence, level and extent of underground

water.

2. Testing:
   a. General: Refer to Section 01 45 23 - TESTING AND INSPECTION SERVICES.
   b. Geotechnical Engineer: A Geotechnical Engineer will be retained by the Contractor to observe performance of and determine compliance with excavation, trenching, filling, backfilling and grading requirements; and perform compaction tests.
   c. Retesting: Paid for by Contractor.

2. PRODUCTS:

A. MATERIALS:
   1. Fill Materials: Fill materials shall be in accordance with the Geotechnical report, Geotechnical Engineer's recommendations, Greenbook section 300 and Whitebook section 300.
   2. Soil Toxicant Material: Refer to Section 31 31 00 - SOIL TREATMENT.
   3. Erosion Control Fabric:
      a. General: Mirafi N-Series geotextiles manufactured by TenCate Geosynthetics North America.
      b. Alternate Manufacturers: Comparable products manufactured by U.S. Fabrics, Inc., or approved equal.
   4. Water: Potable; free of deleterious materials.

3. EXECUTION:

A. PREPARATION:
   1. Environmental Requirements: Do not place, spread or compact fill material during unfavorable weather conditions. When work is interrupted by rain, do not proceed with fill operations until field tests indicate that moisture content and density of previously placed fill is satisfactory.
   2. Examination: Examine conditions of work in place before beginning work; report defects.
   3. General: Verify site conditions shown, report all unidentified conditions to the City Representative.
   4. Utilities: Should unknown active utilities be encountered during work, halt operation and promptly notify the City Representative. Do not proceed until identified and instructions are received from responsible utility company.
   5. Archaeological Artifacts: Should any objects of possible historic interest be encountered during operations, halt work in area of discovery and immediately contact the City Representative for notification of appropriate authorities.

B. LAYOUT:
   1. General: Establish lines, levels and grades; locate work, including existing underground utilities; set markers and stakes.
   2. Trees and Shrubs: Tag or identify existing plant life designated to remain.

C. PROTECTION:
   1. General: Erect and maintain barricades and protection facilities, as required.
   2. Bench Marks: Protect survey control points from damage or displacement.
   3. Utilities: Maintain and protect existing utilities to remain.
   4. Underpinning: Underpin adjacent structures, including service utilities and pipe chases, as required to prevent damage by excavation work.
   5. Shoring, Sheeting, Lagging and Bracing: Provide as required to maintain excavations and banks in a safe and stable condition.
   6. Trees: Carefully protect existing trees and shrubs identified to remain. Replace existing trees and shrubs outside building area damaged by operations.
   7. Blasting: Not permitted.
   8. Drainage: Grade off excavation top perimeter to prevent surface water run-off into excavation or to adjacent properties per Section 31 25 13 - EROSION CONTROL. Keep excavations and sub-grade area free from water during process of work, regardless of cause, source or nature of water.
   9. Dust Control: Wet as required.

D. PERFORMANCE:
   1. General: Provide all grading, excavating and cutting necessary to conform finish grade and contours as shown. Cuts shall be made to true surface of subgrade.
   2. Compaction: ASTM D1557 Compaction Test method; value of optimum moisture content and density will be determined by the Testing Laboratory.
   3. Demolition:
      a. General: Per Section 02 41 00 - DEMOLITION.
      b. Existing Paving: Remove demolished concrete and asphalt concrete paving from site.
      c. Other Obstructions: Remove abandoned utility lines, concrete foundations, etc. Backfill resulting holes as specified.
   4. Clearing and Grubbing: Clearing and Grubbing shall be per the Greenbook section 300-1, and

the Whitebook section 300-1.

5. Rough Grading: Rough grading shall be per the Greenbook section 301-1, and the Whitebook section 301-1.
6. Excavation: Excavations shall be per the Greenbook section 300-2, and the Whitebook section 306-1.
7. Filling and Backfilling: Filling and backfilling shall be per the Greenbook section 306-1, and the Whitebook section 306-1.
8. Finish Grading: Finish grading shall be per the Greenbook section 302-1, and the Whitebook section 301-1.

E. FIELD QUALITY CONTROL
1. Field Testing: Refer to Section 01 45 23 - TESTING AND INSPECTION SERVICES.
2. Retesting: Make necessary corrections to non-conforming work; retest at Contractor's expense.
3. Pad Certification: Provide certification of horizontal and vertical placement of the building pad certification by a Land Surveyor licensed to practice in the State of California .

* * *

EROSION CONTROL Section 31 25 13

1. GENERAL:

A. SUMMARY: Provide wood headers, fabric fencing, straw bales, straw wattles and aggregate bags as shown and specified per Contract Documents.

B. REFERENCES:

1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
2. State of California, Department of Transportation (CalTrans):
   a. Specifications: CalTRANS Standard Specifications.
   b. Erosion Control: Stormwater Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual.
3. California State Water Resources Control Board (SWRCB):
   a. General: Storm water pollution prevention requirements and submittal documents.
   b. Planning and Design Guide: Stormwater Quality Handbook.
   c. General Permit: National Pollutant Discharge Elimination System (NPDES) - General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities
4. California Stormwater Quality Association (CASQA): Stormwater Best Management Practices Handbook.
5. California Redwood Association (CRA): Standard Specifications for Grades of California Redwood Lumber.

C. SYSTEM DESCRIPTION: Design requirements per SWRCB storm water pollution prevention requirements.

D. SUBMITTALS:

1. General: Submit specifications, product data and installation instructions for review.
2. Water Pollution Control Plan (WPCP):
   a. General: Submitted by a qualified Storm Water Inspector, compatible with the Contractor's equipment, methods and means of operation, specifically addressing the following:
      1. Cut and fill operations.
      2. Temporary stockpiles.
      3. Vehicle and equipment maintenance, storage and fueling operations.
      4. Disposal of concrete overages.
      5. Dust control.
      6. Tracking of dirt and mud onto off-site streets and sidewalks.
      7. Pipe flushing operations.
   b. Revisions: Changes to the WPCP shall be made through a qualified storm water individual.

2. PRODUCTS:

A. MATERIALS: Products shall be as specified on the plans and in the WPCP, and shall conform with Caltrans standard specifications section 21.

3. EXECUTION:

A. GENERAL: Erosion control shall be as shown on the plans and in the WPCP and shall conform to Caltrans standard specifications section 21.

* * *

SOIL TREATMENT Section 31 31 00

1. GENERAL:

A. SUMMARY: Provide Soil Treatment, as shown and specified per Contract Documents.

B. REFERENCES:
   1. U.S. Environmental Protection Agency (USEPA): Federal Insecticide, Fungicide and Rodenticide Act.
   2. State of California, Department of Transportation (CalTrans): CalTRANS Standard Specifications.
   3. Standard Specifications for Public Works Construction, ("Greenbook"), 2012 Edition.
   4. City of San Diego Standard Specifications for Public Works Construction, ("Whitebook"), 2012 Edition.

C. SUBMITTALS:
   1. General: Submit product data.
   2. Certificates: Provide certificate of compliance from jurisdictional authority indicating approval of toxicants for use at this location.
   3. Closeout: Submit maintenance data and guarantee in required form for a period of five (5) years from date of final acceptance by Owner. Include coverage for damage and repairs to building and building contents caused by termites.

D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience; manufacturer approved. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS: Materials shall conform to the Greenbook, Whitebook, and manufacturers' recommendations.

B. MIXES: Per manufacturer's instructions.

3. EXECUTION:

A. GENERAL: Execution shall be per the Greenbook, Whitebook, and manufacturors recommendations.

* End Division 31 *

Division 32 - EXTERIOR IMPROVEMENTS

LANDSCAPE MAINTENANCE Section 32 01 33

1. GENERAL:

A. SUMMARY:
1. General: Provide Landscape Maintenance, as shown and specified per Contract Documents.
2. Work Included:
   a. 90 day maintenance for all planting.
   b. Weeding.
   c. Fertilization.
3. Related Work:
   a. Irrigation: Refer to Section 32 84 00 - PLANTING IRRIGATION.
   b. Planting: Refer to Section 32 93 10 - TREES, PLANTS AND GROUND COVER.

B. QUALITY ASSURANCE:
1. Provide services by an experienced landscaping maintenance company.

C. MAINTENANCE PERIOD:
1. Continuously maintain all site areas involved in this contract during the progress of work and during the maintenance period until final acceptance of the work by Owner. Improper maintenance or possible poor condition of the project at the termination of the scheduled maintenance period may cause postponement of the final completion date of the Contract at no additional cost to Owner. Continue maintenance until acceptable to the Owner.
2. Provide sufficient numbers of workers and adequate equipment to perform work during maintenance period.
3. Maintenance period does not start until all elements of construction, planting, and irrigation for the complete project are in accordance with the contract documents for this project.
4. Request an inspection to begin maintenance period after all planting and related work has been completed in accordance with contract documents. Maintenance period commences as described in written notification by the Owner.
5. Prior to commencement of maintenance period, ensure that all ground covers and lawn areas have been planted and that all lawn areas show an even, healthy stand of grass seedlings or sod, grass having been mown twice.
6. Any day or days that there is failure to properly maintain plantings, replace suitable plants, perform weed control or maintain hardscape areas will not be credited as part of the 120 days maintenance. The project will not be segmented into maintenance phases.
7. Keep paved areas free of silt, dirt, leaves and other planting area debris. Maintain these areas at least broom clean through the duration of the maintenance period, cleaning no less often than once per week.

D. GUARANTEE AND REPLACEMENT:
1. Guarantee: Guarantee plant material against any and all poor, inadequate or inferior materials and workmanship for one year. Replace plants found to be dead or in poor condition due to faulty materials or workmanship, at no extra cost to Owner.
2. Replacement: Replace materials found to be dead, missing or in poor condition during the maintenance period immediately. The Owner is the sole judge of the acceptability of condition. Make replacements of materials within 15 days after condition develops or written notification from Owner has been sent. Owner has the right to make emergency repairs without releasing Contractor's guarantee and warranty to Owner.

E. INSPECTIONS:
1. Request normal progress inspection at least 72 hours in advance of an anticipated inspection. Inspections are as follows:
   a. Immediately prior to commencement of this maintenance work.
   b. Completion of first 180 day Maintenance Period (for Green Roof).
   c. Final acceptance.

F. PROJECT FINAL ACCEPTANCE:
1. Prior to date of final inspection, acquire approved reproducible prints and finally record from the job record set, all changes made during construction and deliver them to Owner.
2. Deliver guarantees to Owner.

2. PRODUCTS:

A. MATERIALS:
1. Ensure that all materials conform to other sections of these specifications for planting and irrigation, and as acceptable to Owner.
2. Provide monthly record of all herbicides, insecticides and disease control chemicals used on site.

3. EXECUTION:

A. MAINTENANCE:
1. Weed and cultivate all areas at intervals of not more than 10 days.
2. Perform watering, trimming, fertilization, spraying, pest control, and cleaning as may be required.
3. Street gutters and curbs are to be included.
4. Maintain adequate protection for people and property, and be financially responsible for damages and injuries. Notify Owner immediately should damage occur as a result of maintenance operations and provide repair or remuneration as required by Owner.

B. TREE AND SHRUB CARE:
1. Watering: Maintain a large enough water basin around plants so that enough water can be applied to establish moisture through the major root zone. When hand watering, use a water wand to break force of water.
2. Pruning:
   a. Prior to any pruning obtain written approval from the Owner to proceed.
   b. Trees:
      1. Propose tree pruning to the Owner should there be health or structural reasons for doing so, including the need to eliminate diseased or damaged growth, eliminate structurally unsound growth, reduce potential for wind toppling or wind damage, or maintain growth within limited space.
      2. If requested by the Owner provide pruning for aesthetic enhancement according to "Pruning" by Sunset Books.
      3. Major pruning of deciduous trees shall be during their dormant season.
   c. Shrubs:
      1. The objectives of shrub pruning are the same as for trees. Do not clip shrubs into balled or boxed forms unless such is required by the design.
      2. Make pruning cuts to lateral branches or buds or flush with trunk. Stubbing will not be permitted.
3. Staking and Guying: Ensure that stakes and guys remain in place through acceptance and monitor to prevent girdling of trunks or branches and to prevent rubbing that causes bark wounds. All nursery stakes shall be removed.
4. Weed Control: Keep all areas free of weeds. Use recommended legally approved herbicides. Avoid frequent soil cultivation that destroys shallow roots. Use mulches per specifications to help prevent weed seed germination.
5. Insect and Disease Control: Maintain a reasonable control with approved materials.
6. Fertilize as specified by the agronomic soils testing recommendations and as follows for bid purposes:
   a. Commencement of maintenance period - 6 pounds per 1,000 square feet with top dress fertilizer.
   b. At end of first 30 days of maintenance period - 6 pounds per 1,000 square feet with top dress fertilizer.
   c. At end of maintenance period and at 30 day intervals should maintenance period be extended for any reason - 6 pounds per 1,000 square feet with fertilizer mix.
   d. Avoid applying fertilizer to the root ball and base of main stem; rather, spread evenly under plant to drip line. Rates will vary from about a cup of nitrate fertilizer (depending upon nitrogen percentage) around a newly installed small plant to about 1/2 pound of actual nitrogen per inch of truck diameter measured four feet from the ground for mature trees.
7. Replacement of plants: Replace dead, dying and missing plants with plants of a size, condition and variety acceptable to Owner at no additional cost to the Owner.

C. GROUND COVER CARE:
1. Weed control: Control weeds, preferably with pre-emergent herbicides, but also by hand or with selective systemic herbicides. Hoe weeds as little as possible since this may result in plant damage.
2. Watering: Water enough that moisture penetrates throughout root zone and only as frequently as is necessary to maintain healthy growth.
3. Trash: Remove as it accumulates, but no less often than weekly.
4. Edging and trimming: Edge ground cover to keep in bounds.
5. Replace dead and missing plants at no additional cost to the Owner.

D. IRRIGATION SYSTEM:
1. Inspection: Check all systems for proper operation. Lateral lines must be flushed out after removing the last sprinkler head or two at each end of the lateral. Adjust heads as necessary for unimpeded coverage and no overspray.
2. Controllers: Set and program automatic controllers for seasonal water requirements. Give Owner a key to controllers and instruction on how to turn off system in case of emergency as specified in other sections of these specifications.
3. Repair all damages to irrigation system at no additional cost to the Owner. Make all repairs within one watering period.

* * *

ASPHALT PAVING Section 32 12 16

1. GENERAL:

A. SUMMARY: Provide Asphalt Concrete Paving, as shown and specified per Contract Documents.

B. REFERENCES:

1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
2. American Wood Preservers Association (AWPA):
   a. AWPA C1: All Timber Products - Preservative Treatment by Pressure Processes.
   b. AWPA C2: Wood Preservative Treatment by Pressure Process.
3. Southern California Chapter of the American Public Works Association and the Southern California Districts of the Associated General Contractors of California: "Green Book" - Standard Specifications for Public Works Construction.
4. Standard Specifications for Public Works Construction, ("Greenbook"), 2012 Edition.
5. City of San Diego Standard Specifications for Public Works Construction, ("Whitebook"), 2012 Edition.

C. SUBMITTALS:

1. General: Submit product data.
2. Closeout: Submit maintenance data.

2. PRODUCTS:

A. MATERIALS AND MIXES:

1. General: All materials and mixes shall conform to the above references, the Greenbook section 400, Whitebook section 400, and Caltrans standard specifications section 39.
2. Bumpers: Precast concrete as shown.

3. EXECUTION:

A. PREPARATION:

1. General: Preparations shall conform with the references, the Greenbook section 302-5, Whitebook section 302-5, Caltrans standard specifications section 39 and per the manufacturer's recommendations.
2. Examination: Examine conditions of work in place before beginning work; report defects.
3. Measurements: Take field measurements; report variance between plan and field dimensions.
4. Preparation of Subgrade: Shall conform to the references, the Greenbook section 302-5, Whitebook section 302-5, Caltrans standard specifications section 39 and per the manufacturer's recommendations. Compact to not less than 95% of maximum dry density per ASTM D1557, as specified under Section 31 20 10 - EARTHWORK.

B. INSTALLATION:

1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Required Thickness after Compaction:
   a. Cement Treated Base Course: As shown.
   b. Portland Cement Concrete Surface Course: As shown.
3. Asphalt Paving:
   a. Aggregate Base Course: Install per Standard Specifications Section 302-5; compact to relative compaction of not less than 95% per ASTM D1557.
   b. Sterilant: Apply per manufacturer's instructions over entire base course area just prior to application of asphalt.
   c. Asphalt Concrete Surface Course: Per Standard Specifications,.
   d. Seal Coat: Per Standard Specifications, Subsection 302-8. Thoroughly clean all surfaces of dust, oil spots and other foreign material. Apply a minimum of 30 days after placement of paving. Mix and apply per manufacturer's instructions.
4. Patching: Cut existing paving square and plumb at all edges to be joined by new paving. Prime vertical surfaces before installing new work. Warp carefully to flush surface, with seal over joints, and feather edge. Patch existing paving where cut for installation of piping or conduits under Division 22 - PLUMBING and Division 26 - ELECTRICAL.
5. Line Painting: Refer to Section 32 17 23 - PAVEMENT MARKINGS.
6. Bumpers: Install where shown, with steel dowels; do not damage bumpers or asphalt concrete paving.

* * *

CONCRETE PAVING Section 32 13 13

1. GENERAL:

A. SUMMARY: Provide Concrete Paving, as shown and specified per Contract Documents.

B. REFERENCES:

1. American Concrete Institute (ACI):
   a. ACI 117: Standard Tolerances for Concrete Construction and Materials.
   b. ACI 211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
   c. ACI 211.2: Recommended Practice for Selecting Proportions for Normal Weight Concrete.
   d. ACI 302.1R: Guide for Floor and Slab Construction.
   e. ACI 303R: Guide to Cast-in-Place Architectural Concrete Practice.
   f. ACI 304R: Guide for Measuring, Mixing, Transporting and Placing Concrete.
   g. ACI 305R: Hot Weather Concreting.
   h. ACI 306R: Cold Weather Concreting.
   i. ACI 308: Standard Practice for Curing Concrete.
   j. ACI 347R: Guide to Formwork for Concrete.
   k. ACI SP-66: Detailing Manual.
2. The Engineered Wood Association (APA): Standard Grading Rules.
3. American Society for Testing and Materials (ASTM):
   a. General: Materials and testing standards as identified throughout this Section or within referenced manufacturers standard specifications.
   b. ASTM C39: Standard Test Methods for Compressive Strength of Cylindrical Concrete Specimens.
   c. ASTM C94: Standard Specifications for Ready-Mixed Concrete.
   d. ASTM E329: Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
4. State of California, Department of Transportation (CalTrans): CalTRANS Standard Specifications.
5. Concrete Reinforcing Steel Institute (CRSI): Concrete Reinforcing Steel Institute Manual of Standard Practice.
6. National Institute of Standards and Technology (NIST):
   a. PS-1: Construction and Industrial Plywood.
   b. PS-20: American Softwood Lumber Standard.
7. National Ready-Mixed Concrete Association (NRMCA): Check List for Certification of Ready Mixed Concrete Production Facilities.
8. Southern California Chapter of the American Public Works Association and the Southern California Districts of the Associated General Contractors of California: "Green Book" - Standard Specifications for Public Works Construction.
9. Standard Specifications for Public Works Construction, ("Greenbook"), 2012 Edition.
10. City of San Diego Standard Specifications for Public Works Construction, ("Whitebook"), 2012 Edition.

C. SUBMITTALS:

1. General: Submit product data, samples of concrete finishes and manufacturer's standard colors, and test reports per CBC.
2. Shop Drawings:
   a. Submit manufacture and installation details per ACI 315, including fastenings, for review.
   b. Formwork: Design formwork per ACI and CBC requirements.
   c. Reinforcing: Indicate bar sizes, spacings, locations and quantities of reinforcing steel and wire fabric; bending and cutting schedules, including supporting and spacing devices and fastenings.
   d. Design Mixes: Submit concrete mix designs for review.
3. Placement Records: Keep on job site until completion, and open to inspection, record showing time and date and accurate location of placement of concrete.
4. Certificates:
   a. General: Submit certification stating that products used to manufacture concrete delivered to the site meet or exceed the material and testing requirements of these specifications.
   b. Reinforcement: Submit mill test and chemical analysis certificates for all reinforcing steel delivered to the site.

D. QUALITY ASSURANCE:

1. Qualifications: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
2. Testing: Tests by Testing Laboratory appointed by Owner and under directions of City

Representative; expense of testing borne by Owner; make tests per CBC.

2. PRODUCTS:

A. MATERIALS, FABRICATIONS AND MIXES: All materials, fabrications and mixes shall conform to the Greenbook section 302-6 and the Whitebook section 302-6.

3. EXECUTION:

A. PREPARATION:
   1. General: Preparation shall conform to the references, the Greenbook section 302-6 Whitebook section 302-6, and per the manufacturer's recommendations.
   2. Examination: Examine conditions of work in place before beginning work; report defects. Verify granular sub-base materials have been placed to the depth shown.
   3. Measurements: Take field measurements; report variance between plan and field dimensions.
   4. Protection: Protect finish surfaces adjacent to locations scheduled for placement of concrete.

B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Earthwork: Refer to Section 31 20 10 - EARTHWORK for excavation, sub-base and backfill requirements. Conform to levels and grades shown.
   3. Toxicant Chemicals: Refer to Section 31 31 00 - SOIL TREATMENT; apply under concrete walks, paving and where shown.
   4. Formwork: Shall conform to the Greenbook and Whitebook.
   5. Reinforcement: Shall conform to the referenced standards and manufacturer's recommendations.
   6. Cast-in-place Concrete: Shall conform with the referenced standards, the Greenbook, the Whitebook, and the manufacturer's recommendations

C. FIELD QUALITY CONTROL:
   1. General: Per CBC, Section 1905.6; agency selected and paid for by Owner.
   2. Field Testing:
      a. General: Take three (3) cylinders and test, for each 50 cubic yards of each concrete mix being placed each day. Test first cylinder at the age of 7 days and the other at 28 days; cylinder for 28-day test will not be broken if cylinder for 7-day test meets 28 day strength. Hold third cylinder for 56 day test, if required.
      b. Reinforcement: Make one (1) tensile test and one (1) bend test of specimen taken from each 10 tons of steel delivered to the site.
   3. Retesting: Cost of retests or coring because of understrength, questionable or defective concrete will be paid for by Contractor.

D. CLEANING: Clean exposed surfaces after finish treatment to remove stains, markings, dust, and debris. Do not use cleaning materials or processes that could change the appearance of concrete finishes. Protect adjacent surfaces from staining or damage due to cleaning operations.

* * *

PAVEMENT MARKING Section 32 17 23

1. GENERAL:

A. SUMMARY: Provide Pavement Marking, as shown and specified per Contract Documents.

B. REFERENCES:

1. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
2. Americans with Disabilities Act (ADA):
   a. General: Americans with Disabilities Act of 1990, ADA - 42 U.S. Code Chapter 126.
   b. ADA Standards for Accessible Design: U.S. Department of Justice, 28 CFR Part 36.
3. Master Painters Institute (MPI): Painting Manuals.
4. National Paint and Coatings Association (NPCA): Guide to U.S. Government Paint Specifications.
5. State of California, Department of Transportation (CalTrans): CalTRANS Standard Specifications.
6. Standard Specifications for Public Works Construction, ("Greenbook"), 2012 Edition.
7. City of San Diego Standard Specifications for Public Works Construction, ("Whitebook"), 2012 WPCP 12 Edition.

C. SUBMITTALS:

1. General: Submit product data and a certificate stating compliance with federal, state and local VOC regulations.
2. Samples:
   a. General: Submit manufacturer's standard colors for each surface finishing product specified.
3. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS AND MIXING: Materials and mixing shall conform to the referenced standards, the Greenbook, the Whitebook, the manufacturer's recommendations, and as shown on the plans and as directed by the engineer.

3. EXECUTION:

A. GENERAL: Shall conform with the referenced standards, the Greenbook, the Whitebook, and the manufacturer's recommendations.

* * *

TACTILE WARNING SURFACING Section 32 17 26

1. GENERAL:

A. SUMMARY: Provide Tactile Warning System, as shown and specified per Contract Documents.
B. REFERENCES:
   1. Americans with Disabilities Act (ADA):
      a. General: Americans with Disabilities Act of 1990, ADA - 42 U.S. Code Chapter 126.
      b. ADA Standards for Accessible Design: U.S. Department of Justice, 28 CFR Part 36.
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   3. City of San Diego Standard Specifications for Public Works Construction, ("Whitebook"), 2012 Edition.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

2. PRODUCTS:

A. MATERIALS: Shall conform to the referenced standards, the Whitebook, and the manufacturer's recommendations.

3. EXECUTION:

A. PREPARATION:
   1. Environmental Requirements: Do not install when temperature may fall below 40 degrees within 24 hours of installation.
   2. Examination: Examine conditions of work in place before beginning work; report defects.
B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Tactile Warning Tile: Install with anchors and sealant as shown.

* * *

CHAIN LINK FENCES AND GATES Section 32 31 13

1. GENERAL:

A. SUMMARY: Provide Chain Link Fencing, as shown and specified per Contract Documents.
B. REFERENCES:
   1. American Iron and Steel Institute (AISI): Standard for barbed tape.
   2. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
   3. Chain Link Fence Manufacturing Institute (CLFMI): Standards.
   4. State of California, Department of Transportation (CalTrans):
      a. Specifications: CalTRANS Standard Specifications.
      b. Plans: CalTRANS Standard Plans.
C. SUBMITTALS:
   1. General: Submit product data, shop drawings and samples.
   2. Certificates: Manufacturer's certification that metal components meet standards as specified.
   3. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.
D. QUALITY ASSURANCE: Installer specializing in the work of this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. General: Chain link fence products shall conform to Caltrans standard specifications and drawings.
   2. Sliding Gate: Manufacturers standard sliding gate, size as shown.
   3. Gate Operator:
      a. General: 9200 Series manufactured by DoorKing, Inc.
      b. Alternate Manufacturers: Comparable products manufactured by Master-Halco, Inc. or approved equal.
      c. Controls:
         (1) Keypads: Manufacturers standard digital surface mount - lighted.
         (2) Wireless: Manufacturers standard Secure RF Control.
   4. Privacy Slats:
      a. General: FinLink as manufactured by Pexco; slat color selected by the City Representative.
      b. Alternate Manufacturers: Comparable products manufactured by Master-Halco, Inc. or approved equal.

3. EXECUTION:

A. PREPARATION AND INSTALLATION:
   1. General: Preparation and installation shall conform to Caltrans standard specifications and drawings.
   2. Sliding Gate and Operator:
      a. General: As shown, per manufacturer's instructions; coordinate operator anchorage with Section 03 30 00 - CAST-IN-PLACE CONCRETE.
      b. Power: Per Division 26 - ELECTRICAL.

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PLANTING IRRIGATION Section 32 84 00

1. GENERAL:

A. WORK INCLUDED:
1. Pipe and fittings, valves, sprinklers, bubblers, and accessories.
2. Connection to utilities.
3. Control system.

B. RELATED WORK
1. Section 02950: Trees, Plants, and Ground Cover.

C. REFERENCES
1. ANSI/ASTM D2282 -Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (SDR-PR).
2. ANSI/ASTM D2564 -Solvent Cement for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
3. ASTM B32 -Solder Metal.
4. ASTM B88 -Seamless Copper Water Tube.
5. ASTM D2235 -Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
6. ASTM D2241 -Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
7. FS O-F-506 -Flux, Soldering; Paste and Liquid.

D. SYSTEM DESCRIPTION
1. Electric solenoid controlled underground irrigation system, with low point self drain.

E. SUBMITTALS
1. Submit under provisions of Section 01 33 10 - SUBMITTALS
2. Shop Drawings: Indicate piping layout to water source, location of sleeves under pavement, location and coverage of sprinkler heads, plant and landscaping features, site structures, schedule of fittings to be used.
3. Product Data: Provide component and control system and wiring diagrams.
4. Samples: Provide one outlet of each type, with housing. Accepted samples may be used in Work.
5. Manufacturer's Installation Instructions: Include controller.
6. Controller Charts:
   a. Provide one controller chart for each controller.
   b. Show area controlled by automatic controller. Provide chart of maximum size controller door will allow.
   c. Use reduced actual record drawing for chart, except when controller sequence is illegible after reduction, then enlarge to readable size.
   d. Use different colors to indicate coverage of each station.
   e. Seal completed and approved drawings between 10 mil thick plastic sheets.
7. Tools and Equipment: Supply the following to the Owner at completion of project:
   a. Two sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied on project.
   b. Two 5 foot valve keys for operation of gate valves.
   c. Two keys for each automatic controller.
   d. One quick coupler key and matching hose swivel for every five of each type of quick coupling valves supplied on project.

F. PROJECT RECORD DOMCEUNTS
1. Submit under provisions of Section 01 77 00 - CLOSEOUT PROCEDURES.
2. Accurately record actual locations of piping system and valves.
3. Dimension from two permanent points of reference such as building corners, sidewalks, or road intersections, the location of the following:
   a. Connection to water lines.
   b. Connection to electrical power.
   c. Gate valves.
   d. Routing of sprinkler pressure lines (dimension maximum 100 foot route).
   e. Sprinkler control valves.
   f. Routing of control wiring.
   g. Quick coupling valves.
   h. Other related equipment.

G. OPERATION AND MAINTENANCE DATA
1. Submit under provisions of Section 01 77 00 - CLOSEOUT PROCEDURES.
2. Provide instructions in English or American for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
3. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.

H. REGULATORY REQUIREMENTS
1. Conform to applicable code for piping and component requirements.

2. Provide certificate of compliance from authority having jurisdiction indicating approval of products in system.

I. FIELD MEASUREMENTS
1. Verify that field measurements are as shown on Drawings.

J. EXTRA MATERIALS
1. Provide the following extra components under provisions of Section 01 77 00 - CLOSEOUT PROCEDURES:
   a. Two sprinkler heads of each type and size.
   b. Two valve keys for manual valves.
   c. Two valve box keys.
   d. Two wrenches for each type head core and for removing and installing each type head.

K. GUARANTEE
1. On Company letterhead, re-type the following information and provide to Owner at completion of project:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the Work has been completed in strict accordance with the Contract Documents, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace defects in materials and workmanship, including damages consequential to defects in materials or workmanship, which develop during two (2) year after completion and acceptance of work, at no cost to Owner. We agree to make such repairs and replacements within a reasonable time, as determined by Owner, after receipt of Notice. In a reasonable time after notification by Owner, we authorize Owner to proceed to have such repairs and replacements made at our expense and we will pay all costs and charges upon demand.

Project:
Location:
Signed:_____
Company:
Address:
Date of Acceptance:

2. PRODUCTS:

A. MANUFACTURERS
1. Nibco Product Gate valves.
2. Febco Product Backflow preventers.
3. Valcon Product Check valves.
4. Carson Industries Product Control valve boxes.
5. Rainbird Product Controllers, Remote Control Valves, Sprinklers, and Bubblers.
6. Substitutions: Under provisions of Section 01 60 00 - PRODUCT REQUIREMENTS

B. MATERIALS
1. Pipe: PVC in accordance with ASTM D2241; 200 pressure rated upstream from controls, 160 psi downstream; solvent-weld sockets; 2 inches and larger - Class 315; 1-1/2 inches and smaller - Schedule 40; Class 200. Pipe: ASTM B88, Type K drawn temper copper.
2. Fittings: NSF approved, type and style of connection to match pipe.
3. Solvent Cement: ANSI/ASTM D2564 for PVC pipe and fittings.
4. Sleeve Material: PVC Schedule 40.
5. Above-Grade Pipe: UV-Resistant PVC in accordance with ASTM D2241; 200 pressure rated upstream from controls, 160 psi downstream; solvent-weld sockets; 2 inches and larger – Class 315; 1-1/2 inches and smaller – Schedule 40.

C. OUTLETS
1. Outlets: Brass construction.
2. Rotary Type Sprinkler Head: Pop-up type with screens; fully adjustable for flow and pressure; size as indicated; with letter or symbol designating degree of arc and arrow indicating center of spray pattern.
3. Spray Type Sprinkler Head: Pop-up head with full circle, half circle, third circle, quarter circle, square pattern.
4. Bubbler: Adjustable outlet.
5. Quick Coupler: With Locking Cover.

D. VALVES
1. Gate Valves: Bronze construction, non-rising stem, inside screw with threaded ends.
2. Backflow Preventers: Bronze body construction, reduced pressure zone type.
3. Valve Box and Cover: Plastic Body Construction.

E. CONTROLS
1. Controller: Automatic controller, microprocessor solid state control with visible readout display, temporary override feature to bypass cycle for inclement weather, timer for a 40 station system, programmable for 14 days in one minute increments, with automatic start and shutdown.
2. Controller Housing: Weatherproof, watertight, with lockable access door.
3. Electric Solenoid: Normally closed valves to control wiring, including required fittings and accessories.
4. Wire: Color coded.

3. EXECUTION:

A. EXAMINATION
1. Verify that field conditions are acceptable and are ready to receive work.
2. Verify location of existing utilities.
3. Verify that required utilities are available, in proper location and ready for use.
4. Beginning of installation means installer accepts existing conditions.

B. PREPARATION
1. Piping layout indicated is diagrammatic only. Route piping to avoid plants and structures.
2. Layout and stake locations of system components.
3. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

C. TRENCHING
1. Trench and backfill in accordance with Section 31 20 10 - EARTHWORK.
2. Minimum Trench Width: 12 inches.
3. Minimum Trench Depth: 18 inches for pressure supply lines; 12 inches for non-pressure lines; and 18 inches for control wiring.
4. Trench to accommodate grade changes.
5. Maintain trenches free of debris, material, or obstructions that may damage pipe.

D. INSTALLATION
1. Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions.
2. Connect to water and electrical service.
3. Set sprinkler heads and box covers at finish grade elevations.
4. Provide for thermal movement of components in system.
5. Use threaded nipples for risers to each outlet to facilitate easy replacement.
6. Install control wiring. Provide 10 inch expansion coil at each valve to which controls are connected, and at 100 ft intervals. Bury wire beside pipe.
7. After piping is installed but before sprinkler heads are installed and backfilling commences, open valves and flush system with full head of water.

E. FIELD QUALITY CONTROL
1. Field inspection and testing will be performed under provisions of Section 01 43 00 - QUALITY ASSURANCE.
2. Prior to backfilling, test system for leakage for whole system to maintain 150 psi pressure for one hour. System acceptable if no leakage or loss of pressure occurs during test period.

F. BACKFILLING
1. Provide 3 inch sand cover over piping. Backfill trench and compact to subgrade elevation as specified in other Sections of these Specifications. Protect piping from displacement.
2. Replace Work damage by the work of this Section with equivalent products.

G. INSTALLER'S FIELD SERVICES
1. Prepare and start systems under provisions of Section 01 60 00 - PRODUCT REQUIREMENTS.
2. Prove one complete spring startup and a fall shutdown.

H. ADJUSTING
1. Adjust work under provisions of Section 01 60 00 - PRODUCT REQUIREMENTS.
2. Adjust control system to achieve time cycles required.
3. Change head types as directed.

I. DEMONSTRATION
1. Provide system demonstration under direction of City Representative.
2. Instruct Owner's personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance material as basis for demonstration.

J. FIELD QUALITY CONTROL
1. Flush and adjust sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, parking areas, and structures.
2. If it is determined that adjustments in the equipment can make the system more effective, make the approved adjustments prior to planting. Adjustments could also mean changes in nozzle sizes and degrees of arc.
3. Lowering raised sprinkler heads must be accomplished within ten days after notification by Owner.
4. Set sprinkler heads perpendicular to finished grades unless otherwise shown on Drawings or

directed by City Representative.

5. Ensure complete successful system operation for 7 days under automatic operation prior to any subsequent construction operations such as plantings.

K. FIELD OBSERVATIONS

1. Provide the following observations conducted by the City Representative, scheduled as specified:
   a. Pre-job conference - 7 calendar days.
   b. Pressure supply line installation and testing - 48 hours.
   c. Automatic controller installation - 48 hours.
   d. Control wire installation - 48 hours.
   e. Lateral line and sprinkler installation - 48 hours.
   f. Coverage test - 48 hours.
   g. Final inspection - 7 calendar days.
2. When observations have been witnessed by parties to the Contract other than the City Representative, show evidence of such in writing.
3. Site observations cannot commence without Record Drawings. Party requesting observations are subject to hourly reimbursement to others if observations are requested without all other requirements having been met.

* * *

TREES, PLANTS AND GROUND COVER Section 32 93 10

1. GENERAL:

A. WORK INCLUDED
   1. Preparation of subsoil and topsoil.
   2. Trees, plants, and ground cover.
   3. Mulch and fertilizer.

B. RELATED WORK
   1. Section 31 20 10 - EARTHWORK: Preparation of subsoil and placement of topsoil in preparation for the work of this Section.
   2. Section 32 84 00 - LANDSCAPE IRREGATION.

C. REFERENCES
   1. ANSI Z60.1 -Nursery Stock.
   2. FS O-F-241 -Fertilizers, Mixed, Commercial.

D. DEFINITIONS
   1. Plants: Living trees, plants, and ground cover specified in this Section.

E. OPERATION AND MAINTENANCE DATA
   1. Submit instructions for continuing Owner maintenance under provisions of Section 01 70 00.
   2. Include cutting and trimming methods; types, application frequency, and recommended coverage of fertilizer.

F. QUALITY ASSURANCE
   1. Nursery: Company specializing in growing and cultivating the plants specified in this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
   2. Installer: Company specializing in installing and planting the plants specified in this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
   3. Document that all plant materials are available. Materials are subject to inspection by Landscape Architect after confirmation of ordering.
   4. Materials are subject to inspection by Landscape Architect at place of growth and upon delivery, for conformity to specifications. Inspection, approval and rejection can also take place at other times during progress of Work.
   5. Request in writing, inspection of plant material at place of growth. Identify place of growth, and quantity of plants to be inspected. Inspection may be postponed at Owner's option.

G. REGULATORY REQUIREMENTS
   1. Comply with regulatory requirements for [fertilizer and] herbicide composition.
   2. Plant Materials: Certified by state department of agriculture.

H. DELIVERY, STORAGE, AND HANDLING
   1. Deliver products to site under provisions of Section 01 60 00 - PRODUCT REQUIREMENTS.
   2. Store and protect products under provisions of Section 01 60 00 - PRODUCT REQUIREMENTS. Store plants in an isolated area, sensitive to the shade/sun requirements of the plants and protect from weather.
   3. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
   4. Protect plants until planted. Protect during delivery to prevent root ball damage or desiccation of leaves.
   5. Deliver plant materials immediately prior to placement. Keep plants moist. Maintain and protect material not to be planted within 4 hours, in a healthy, vigorous condition.
   6. Notify Owner 7 calendar days in advance of delivery of plant materials and submit itemization of plants in each delivery.
   7. Plants delivered to project site are to have legible identification labels. Label trees, evergreens, bundles of containers or like shrubs, and groundcover plants. State correct plant name and size indicated on plant list. Use durable waterproof labels with water-resistant ink which will remain legible for at least 60 days.

I. ENVIRONMENTAL REQUIREMENTS
   1. Do not install plant life when ambient temperatures may drop below 35 degrees F or above 90 degrees F.
   2. Do not install plants when wind velocity exceeds 30 mph.

J. SEQUENCING AND SCHEDULING:
   1. Coordinate the work of this Section with installation of underground irrigation system, utilities, piping and watering heads.
   2. Install trees, shrubs, and liner stock plant materials before hydraulic seeding is commenced.

K. WARRANTY
1. Provide a warranty on work of this Section for a minimum one year including one continuous growing season. Commence warranty on date identified in the Letter of Final Acceptance.
2. Warranty: Include coverage of plants from death or unhealthy conditions.
3. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

2. PRODUCTS:

A. NURSERIES
1. Norman's Nursery.
2. Brothers Nursery.
3. Village Nurseries.
4. Substitutions: Under provisions of Section 01 25 00 - SUBSTITUTION PROCEDURES.

B. TREES, PLANTS, AND GROUND COVER
1. Trees, Plants, and Ground Cover: Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the Work.
2. Provide plant materials in accordance with State Department of Agriculture's regulation for nursery inspections, rules, and ratings. Provide plants with a normal habit of growth, sound, healthy, vigorous and free from insect infestations, plant diseases, sunscalds, and other disfigurements.
3. Ensure tree trunks are sturdy and have well hardened systems and vigorous and fibrous root systems which are not root or pot-bound. [In event of disagreement as to condition of root system, the root conditions of the furnished plants in containers will be determined by removal of earth from the roots on not less than two plants, or more than two percent of the total number of plants of each specie or variety. Where container-grown plants are from more than one source, roots of not less than two plants of each species or variety from each source will be inspected. In event that the sample plants inspected are found to be defective, the entire lot or lots of plants represented by the defective samples may be rejected. Plants rendered unsuitable for planting due to this inspection will be considered samples and will be provided at no cost to Owner.
4. Size of plants will correspond with that normally expected for species and variety of commercially available nursery stock or as specified on drawings. The minimum acceptable size of plants measured before pruning with the branches in the normal position, must conform with the measurements specified in the plant list. If Owner approved, larger size plants may be used, but without additional cost. If larger sizes are approved for use, the ball of earth or spread of roots for each plant will be increased proportionately.
5. Plants not meeting these specifications are considered to be defective whether in place or not. They must be immediately removed and replaced with new acceptable and approved plants of the required size, species, and variety at no additional cost.
6. Do not prune, trim, top or alter the shape of trees or plants except as approved.
7. Provide plant materials true to botanical and common name and variety as specified in Annotated Checklist of Woody Ornamental Plants in California, Oregon, and Washington, published by University of California School of Agriculture, latest edition.
8. Nursery grown and collected stock: Grow under climactic conditions similar to those in locality of project. Use only liner stock plant materials well established in removable containers or formed homogeneous soil sections.

C. SOIL MATERIALS
1. Topsoil: Resused and Amended.
   a. For all turf and groundcover areas (excluding slopes over 3:1), provide the following amendments:
      1. a. 6 cubic yards nirogent stabilized organic amendment (per 1000 SF).
      2. 15 pounds 12-12-12 commercial fertilizer (per 1000 SF).
      3. 200 lbs agricultural gypsum (per 1000 SF).
   b. Cultivate all areas to be planted (except slopes greater than 3:1) to a depth of at least 6" so that the soil is loose and friable. For the top 2" of soil in all cultivated areas, remove all stones, roots and other deleterious matter which might be a hindrance to planting and maintenance. 3. For planting areas, uniformly broadcast and thoroughly incorporate to a depth of 4" soil amendments by means of rototiller or approved equal.
2. Imported Amended Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0.
3. Ensure that silt plus clay content of soil does not exceed 20 percent by weight, with a minimum 95 percent passing the 2.0 mm sieve. Do not allow the sodium absorption ratio (SAR) to exceed 6. The electrical conductivity (ECE) of the saturation extract cannot exceed 3.0 millimohs per centimeter at 25 degrees C. Ensure that boron content is less than 1 part per million as measured on the saturation extract. To ensure compliance with these specifications, submit samples of import soil to laboratory for analysis prior to, and following backfilling.

D. SOIL AMENDMENT MATERIALS
   1. Fertilizer: FS O-F-241, Type I, Grade A; with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis.
   2. Organic Amendment:
      a. Nitrogen stabilized: 0.56 to 0.84 percent N based on dry weight for wood residual or rice hulls.
      b. Particle size: 95 to 100 percent passing 6.35 mm standard sieve; 80 to 100 percent passing 2.33 mm standard sieve.
      c. Salinity: Ensure that saturation extract conductivity does not exceed 3.5 millimohs per centimeter at 25 degrees C as determined by saturation extract method.
      d. Iron content: Minimum 0.08 percent dilutes acid soluble Fe on dry weight basis.
      e. Ash: 0 to 6 percent (dry weight).
   3. Soil Sulfur: Agricultural grade sulfur containing minimum of 99 percent sulfur (expressed as elemental).
   4. Iron Sulfate: 20 percent iron (expressed as metallic iron), derived from ferric and ferrous sulfate, 10 percent sulfur (expressed as elemental).
   5. Calcium Carbonate: 95 percent lime as derived from oyster shells.
   6. Gypsum: Agricultural grade product containing 98 percent minimum calcium sulphate.
   7. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 85 percent organic material measured by oven dry weight; 4 to 5 pH range; moisture content of 30 percent.
   8. Bone Meal: Raw, finely ground, commercial grade, minimum of 3 percent nitrogen and 20 percent phosphorous.
   9. Lime: Ground limestone, dolomite type, minimum 95 percent carbonates.
   10. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of plants.

E. MULCH MATERIALS
   1. Mulching Material: wood shavings, free of growth or germination inhibiting ingredients.

F. ACCESSORIES
   1. Wrapping Materials: Burlap.
   2. Tree Stakes: Lodge pole pine, full treated with Coppernapthanate Wood Preservative, FS TT-W-572, Type I, Composition B, 2 inch diameter, 10 feet long, no splits.
   3. Ties: Provide 36 inch corded rubber tie as manufactured by Gro-Strait Products; wire and hose ties by Nunes Turfgrass; rigid tie stock 24 inches as manufactured by VIT Company.
   4. Tree Paint: Morrison Tree Seal, or Cabort Tree Paint.
   5. Sand: Provide washed and dried silica sand.

G. SOURCE QUALITY CONTROL
   1. Provide inspection for verifying acceptability of plants.

3. EXECUTION:

A. EXAMINATION
   1. Verify that prepared subsoil and planters are ready to receive work of this Section.
   2. Saturate soil with water to test drainage.
   3. Verify that required underground utilities are available, in proper location, and ready for use.
   4. Beginning installation means acceptance of existing conditions.

B. PREPARATION OF SUBSOIL
   1. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
   2. Remove foreign materials, weeds, and undesirable plants and their roots. Remove contaminated subsoil.
   3. Scarify subsoil to a depth of 6 inches where plants are to be placed. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted subsoil.
   4. Dig pits and beds 6 inches larger than plant root system.

C. PLACING TOPSOIL
   1. Spread topsoil to a minimum depth of 6 inches over area to be planted. Rake smooth.
   2. Place topsoil during dry weather and on dry subgrade.
   3. Remove vegetable matter and foreign non-organic material from topsoil while spreading.
   4. Grade topsoil to eliminate rough, low, or soft areas, and to ensure positive drainage.
   5. Install topsoil mixture in pits and beds intended for plant root balls, to a minimum thickness as indicated on Drawings.

D. FERTILIZING
   1. Apply fertilizer in accordance with manufacturer's instructions.
   2. Apply after initial raking of topsoil.
   3. Mix thoroughly into upper 2 inches of topsoil.
   4. Lightly water to aid the dissipation of fertilizer.

E. PLANTING
1. Place plants for best appearance for review and final orientation by Landscape Architect. Typically, face plants with fullest growth into prevailing winds.
2. Set plants vertical.
3. Remove non-biodegradable root containers.
4. Set plants in pits or beds, partly filled with prepared topsoil mixture.
5. Backfill container plants with:
    1. 6 parts by volume on-site soil
    4 parts by volume organic amendment
    1 pound 6-20-20 fertilizer mix/cu yd of mix
    2 pounds iron sulfate per cu yd of mix
6. Raise all plants which settle deeper than the surrounding grade. After plant has been placed, add sufficient backfill to hole to cover approximately 1/2 of root ball. Add water to the top and thoroughly saturate root ball and adjacent soil.
7. Remove bottom of plant boxes before planting.
8. After water has completely drained, place planting tablets:
    1. 1 tablet per 1-gallon container
    2. 2 tablets per 5-gallon container
    3. 3 tablets per 15-gallon container
    4. 4 tablets per 24 inch box
    5. 5 tablets per 30 inch box
    6. 6 tablets per 36 inch box
    7. 7 tablets per 42 inch box
    8. 8 tablets per 48 inch and larger boxes

    Set planting tablets with each plant, on top of root ball, while plants are still in their containers so the required number of tablets can be verified.
9. Backfill the remainder of hole and tamp firm. Construct an earthen basin around each plant after backfilling. Provide basin of depth sufficient to hold at least 2 inches of water. Construct basins with amended backfill. Remove basin in all turf areas after initial watering.

F. FIELD QUALITY CONTROL
1. Field inspection will be performed under provisions of Section 01400.
2. Notify Owner and Landscape Architect in advance for the following inspections, according to the times specified:
    a. Pre-job conference - 7 calendar days.
    b. Final grade review - 48 hours.
    c. Plant material review - 48 hours.
    d. Plant layout review - 48 hours.
    e. Soil preparation and planting operations; one tree with each type of specified staking – 48 hours.
    f. Pre-maintenance - 7 calendar days.
    g. Final inspection - 7 calendar days.
    h. Tree tagging in Nursery - 7 calendar days.

* * *

TREE GRATES Section 32 94 23

1. GENERAL:

A. SECTION INCLUDES:
   1. Tree grates as shown on drawings and as specified herein.
B. SUBMITTALS:
   1. Contractor shall submit set(s) of drawings of tree grates and frames for review by architect prior to purchase and installation.
C. QUALITY ASSURANCE:
   1. Manufacturer must have licence to produce Suspended paver systems under U.S Patent # 5,787,637
   2. Installer qualifications: 2 years minimum experience installing tree grates and support frames. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.
D. DELIVERY, STORAGE, AND HANDLING:
   1. Store product in manufacturer's packaging until ready to install.
E. WARRANTY:
   1. Tree grates and frames shall be warranted by the Manufacture against defects in materials and workmanship for a minimum of five (5) years

2. PRODUCTS:

A. TREE GRATES:
   1. Manufacturer: Tree grates shall be as supplied by IRONSMITH,INC., 41-701 Corporate Way, Unit
   2. Palm Desert, CA 92260 (800) 338-4766, no exceptions taken.
   3. Tree grates shall be: PAVER GRATE Model 5296 "Paver-Grate(tm) paver support system tree grate 60"" x 96"" in two sections Galvanized. Patented U.S. Patent 5,787,637" with 10" tree opening .
   4. Paver-Grates shall be manufactured from standard steel shapes to ASTM A36 and expanded metal grating 3# to ASTM A569/569M. If required, Tubing to ASTM A500. Units shall be manufactured true to design and all components shall fit together in a satisfactory manner. Grates are to be of uniform quality, flat and free from distortion.
   5. Finish: Grates are to be supplied galvanized by hot spray and / or hot dip method.
   6. Total quantity .

3. EXECUTION:

A. EXAMINATION:
   1. Do not begin installation until site is properly prepared.
   2. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
B. PREPARATION:
   1. Clean surfaces thoroughly prior to installation
   2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
C. INSTALLATION:
   1. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
D. TREE GRATES / PAVER-GRATES:
   1. Install grates where indicated on plans per details on plans and Manufacturer's instructions.
   2. Paver-Grate footings must be flat and leveled so that grates do not rock or appear unstable before unit pavers are set. Footings are to be set to ensure that unit pavers over the Paver-Grate are flush and level with the surrounding areas.
   3. Cover Paver-Grates with permeable landscape fabric before setting unit pavers to permit sanding joints.
   4. Cut unit pavers to fit around tree opening ensuring a secure fit against Paver-Grate opening stop..
E. CLEAN-UP and PROTECTION:
   1. Protect installed product until completion of project.
   2. DO NOT ALLOW water from new concrete to run off or wash onto tree grates to prevent damage from concrete exudates, lime, and efflorescence.
   3. Touch up, repair or replace damaged products.

* End Division 32 *

Division 33 - UTILITIES

SITE UTILITY SERVICES Section 33 00 10

1. GENERAL:

A. SUMMARY: Provide Site Utility Services, as shown and specified per Contract Documents.

B. REFERENCES:

1. General: Refer to Section 01 42 00 - REFERENCES for reference standards, applicable codes and definitions. Perform Work in accordance with municipal agency and utility company standards and requirements.
2. American Public Works Association (APWA): Standard Specifications for Public Works Construction.
3. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
4. American Welding Society (AWS): Welding Standards.
5. American Water Works Association (AWWA): Standards.
6. State of California, Department of Transportation (CalTrans): Standard Specifications.
7. California State Industrial Accident Commission (CSIAC): Trench Construction Safety Orders.
8. National Fire Protection Association (NFPA): NFPA 13 - Installation of Sprinkler Systems.
9. Intertek Testing Services (ITS): Standards.
10. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
11. Standard Specifications for Public Works Construction, ("Greenbook"), 2012 Edition.
12. City of San Diego Standard Specifications for Public Works Construction, ("Whitebook"), 2012 Edition.

C. SUBMITTALS:

1. General: Submit product data.
2. Certificates: Submit certificate in lieu of manufacturer's name and pressure rating marked on valve body of valves and gas cocks, as required.
3. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

D. QUALITY ASSURANCE: Welders to be AWS certified.

2. PRODUCTS:

A. MATERIALS:

1. Piping:
   a. General: Refer to Division 22 - PLUMBING for detailed pipe and fitting requirements.
   b. Sanitary Sewer:
      1. Outside Property Line: Per applicable utility service regulations and standards.
      2. Within Property: As shown.
      3. Manholes: As shown, per jurisdictional requirements.
   c. Water:
      1. To Meter and Detector Check: Per applicable utility service regulations and standards.
      2. Potable Water from Meter: As shown.
      3. Meter: Per jurisdictional requirements.
   d. Natural Gas:
      1. To Meter: Per applicable utility service regulations and standards.
      2. From Meter: Black steel; buttweld; wrapped and coated.
2. Valves:
   a. General: Outside property line, conform to applicable utility service regulations and standards.
   b. Water:
      1. General: Per AWWA Standards.
      2. Fire Protection: Per UL and FM Standards.
   c. Gas: Per AWWA Standards.
   d. Valve Boxes: As detailed. Precast concrete boxes with extensions and cast iron frame and cover. Cover marked "Water" or "Gas" applicable to valve.
3. Backflow Preventers: Per applicable utility service requirements.
4. Electrical and Communications Service:
   a. Outside Property Line: Per applicable utility service regulations and standards.
   b. Within Property: Refer Division 26 - ELECTRICAL.

5. Detectable Warning Tape: Acid and alkali resistant polyethylene film manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep.
6. Bedding Materials: Refer to Section 31 20 10 - EARTHWORK.
7. Drainage Specialties: Per Section 33 40 00 - STORM DRAINAGE UTILITIES.
8. Landscape Irrigation System: Per Section 32 84 00 - PLANTING IRRIGATION.

3. EXECUTION:

A. PREPARATION:
1. Scheduling: Coordinate off-site service connections and connections within the building line with the work of this Section.
2. Examination: Examine conditions of work in place before beginning work; report defects.
3. Protection: Conform to "Trench Construction Safety Orders", California State Industrial Accident Commission.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified. Lay out systems by instrument; verify location and elevation of points of utility service and existing crossing utilities prior to excavation; notify City Representative of discrepancies noted. Lay pipe true to line and uniform grade commencing at point of utility service connection. Make connections to utility service and building systems.
2. Excavation and Bedding:
   a. General: Per Section 31 20 10 - EARTHWORK. Trench width to be a minimum of 12 inches wider than outside diameter of pipe, bottom smooth and free of irregularities or rock points.
   b. Bedding: Shall conform with the Greenbook section 306.
3. Gravity Flow Sanitary Sewer: Per manufacturer's recommendations for jointing and installation; provide manufacturer's adapters for jointing to other pipe materials.
4. Water Piping:
   a. Jointing: Per manufacturer's recommendations.
   b. Thrust Blocks: Construct as detailed and per local jurisdictional requirements.
   c. Valves: Place at required locations, vertically plumb; set valve boxes to finish elevation.
   d. Utility Service Meters: Locate as shown.
   e. Sidewalk Hydrants: As shown, per local jurisdictional requirements.
5. Gas Piping:
   a. Valves: Place at required locations, vertically plumb; set valve boxes to finish elevation.
   b. Utility Service Meters: Locate as shown.
6. Building Systems Piping: Refer to Division 22 - PLUMBING.
7. Drainage System: Per Section 33 40 00 - STORM DRAINAGE UTILITIES.
8. Landscape Irrigation: Per Section 32 84 00 - PLANTING IRRIGATION.
9. Electrical and Communications Service: Per Division 26 - ELECTRICAL and Division 27 - COMMUNICATIONS.
10. Detectable Warning Tape:
   a. General: Identify pipe and conduit with color coding as follows:
   b. Red: Electric.
   c. Yellow: Gas, oil, steam, and dangerous materials.
   d. Orange: Telephone and other communications.
   e. Blue: Water systems.
   f. Green: Sewer systems.
11. Backfilling:
   a. General: Per Section 31 20 10 - EARTHWORK do not start backfill operations until required testing has been accomplished.
   b. Detectable Warning Tape: Shall conform to referenced standards, local jurisdictional requirements, the Greenbook, the White book, and the manufacturer's recommendations.
   c. Trenches and Excavations: Shall conform to referenced standards, local jurisdictional requirements, the Greenbook, the White book, and the manufacturer's recommendations.

C. FIELD QUALITY CONTROL:
1. Testing: Shall conform to referenced standards, local jurisdictional requirements, the Greenbook, the White book, and the manufacturer's recommendations.
2. Disinfection: Flush and disinfect per Section 33 13 05 - DISINFECTION.
3. Retesting: Make necessary corrections to work that is not in conformance with specified requirements and retest at Contractor's expense.

* * *

DISINFECTION Section 33 13 05

1. GENERAL:

A. SUMMARY: Provide Disinfection of Water Distribution Systems, as shown and specified per Contract Documents.

B. REFERENCES:
   1. American Water Works Association (AWWA): Standards.
      a. AWWA B300: Standard for Hypochlorites.
      b. AWWA B301: Standard for Liquid Chlorine.
      c. AWWA B302: Standard for Ammonium Sulfate.
      d. AWWA B303: Standard for Sodium Chlorite.
      e. AWWA C651: Standards for Disinfecting Water Mains.
   2. City of San Diego Standard Specifications for Public Works Construction, ("Whitebook"), 2012 Edition.

C. SUBMITTALS:
   1. Test Reports: Shall conform to the Whitebook section 306-1.4.7
   2. Closeout: Submit maintenance data.

D. QUALITY ASSURANCE:
   1. General: Installer specializing in disinfecting potable water systems specified in this Section with minimum two (2) years documented experience. General Contractor to determine that the subcontractor has demonstrated the necessary skill and competence to perform the required work.

2. PRODUCTS:

A. MATERIALS:
   1. Disinfection Chemicals: AWWA type as required by local jurisdictions.

3. EXECUTION:

A. PREPARATION: Examine conditions of work in place before beginning work; report defects.

B. INSTALLATION:
   1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
   2. Disinfection: Provide and attach required equipment to site water lines to perform the work of this Section. Introduce treatment into system and maintain disinfectant in system for 24 hours. Flush, circulate, and clean until cleanliness required by jurisdiction is achieved. Replace permanent system devices removed for disinfection.

C. FIELD QUALITY CONTROL:
   1. General: Refer to section 01 43 00 - QUALITY ASSURANCE.
   2. Field Testing: Test samples in accordance with AWWA C651 and jurisdictional criteria as required.

* * *

STORM DRAINAGE UTILITIES Section 33 40 00

1. GENERAL:

A. SUMMARY: Provide Site Drainage Utilities, as shown and specified per Contract Documents.

B. REFERENCES:
1. American Association of State Highway and Transportation Officials (AASHTO): Standards.
2. American Public Works Association (APWA): Standard Specifications for Public Works Construction
3. American Society for Testing and Materials (ASTM): Materials and testing standards as identified throughout this Section or within referenced manufacturers' standard specifications.
4. American Welding Society (AWS): Welding Standards.
5. State of California, Department of Transportation (CalTrans):
   a. Specifications: CalTRANS Standard Specifications.
   b. Plans: CalTRANS Standard Plans.
6. California Occupational Safety and Health Administration (CalOSHA): Construction Safety Orders.
7. California State Industrial Accident Commission (CSIAC): Trench Construction Safety Orders.
8. Cast Iron Soil Pipe Institute (CISPI): Standards.
9. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory and Building Material Directory.
10. Standard Specifications for Public Works Construction, ("Greenbook"), 2012 Edition.
11. City of San Diego Standard Specifications for Public Works Construction, ("Whitebook"), 2012 Edition.

C. SUBMITTALS:
1. General: Submit product data and shop drawings.
2. Closeout: Submit maintenance data and guarantee in required form for a period of one (1) year from date of final acceptance by Owner.

D. QUALITY ASSURANCE: Welders to be AWS certified.

2. PRODUCTS:

A. MATERIALS:
1. Pipe: Shall conform to the Greenbook section 207 and the Whitebook section 207.
2. Manhole: Shall conform to the local jurisdictional requirements, the Greenbook, and the Whitebook.
3. Drop Inlet: Shall conform to the local jurisdictional requirements, the Greenbook, and the Whitebook.
4. Area Drain: Shall conform to the local jurisdictional requirements, the Greenbook, and the Whitebook.
5. Exterior Floor and Planter Drains: Shall conform to the local jurisdictional requirements, the Greenbook, and the Whitebook.
6. Trench Drain: Shall conform to the local jurisdictional requirements, the Greenbook, and the Whitebook.
7. Clean out to Grade (COTG): Shall conform to the local jurisdictional requirements, the Greenbook, and the Whitebook.
8. Filter Fabric: Shall conform to the local jurisdictional requirements, the Greenbook, and the Whitebook.
9. Concrete: Refer to Section 03 30 00 - CONCRETE.
10. Mortar: ASTM C270.
11. Fasteners: As recommended by manufacturer.

3. EXECUTION:

A. PREPARATION:
1. Scheduling: Coordinate off-site connection and connection within the building lines with the work of this Section.
2. Examination: Examine conditions of work in place before beginning work; report defects.
3. Measurements: Take field measurements; report variance between plan and field dimensions.
4. Protection: Conform to "Trench Construction Safety Orders", California State Industrial Accident Commission.

B. INSTALLATION:
1. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.
2. Excavation and Bedding: Shall conform to the local jurisdictional requirements, the Greenbook section 306, and the Whitebook section 306.
3. Laying of Pipe: Shall conform to the local jurisdictional requirements, the Greenbook section 306, and the Whitebook section 306.

4. Drains: Install as shown.
5. Manholes: Install as shown.
6. Filter Fabric: Install where shown.
7. Concrete Bases: Cast-in-place or precast as shown; refer to Section 03 30 00 - CONCRETE.
8. Mortar: Set pipe connections to concrete drainage structures; place mortar within one (1) hour after adding water.
9. Connection: As required by jurisdictional agency and per Division 22 - PLUMBING
10. Backfilling:
    a. General: Do not start backfill operations until required testing has been accomplished.
    b. Trenches and Excavations: Shall conform to the local jurisdictional requirements, the Greenbook, and the Whitebook.
    c. Compaction and Grading: Provide remainder of backfill per Section 31 20 10 - EARTHWORK
11. Off Site Work: Provide work beyond the property lines in strict conformance with the requirements of the governmental agencies having jurisdiction.
12. Flushing: Flush and/or rod storm drainage system at completion of installation; refer to Section 33 13 05 - DISINFECTION as applicable. Remove all dirt and debris from system.

C. FIELD QUALITY CONTROL:
1. General: Thoroughly rod and flush entire drainage system.
2. Field Testing: Shall conform to the local jurisdictional requirements, the Greenbook, and the Whitebook.
3. Retesting: Make necessary corrections to non-conforming work; retest at Contractor's expense.

* End Division 33 *

ATTACHMENT F

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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 ERICKSON-HALL CONSTRUCTION CO., herein called "Contractor" for construction of **Fire Station No. 5**; Bid No. **K-16-6141-DBB-3-C-A** in the amount of SIX MILLION ONE HUNDRED AND FORTY EIGHT THOUSAND DOLLARS AND ZERO CENTS ($6,148,000.00), which is comprised of the Base Bid alone.

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 No. 5**, on file in the office of the Public Works Department as Document No. **S-00788** 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 No. 5,** Bid Number **K-16-6141-DBB-3-C-A,** 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

By _____

By _____

Albert P. Rechany
Deputy Director
Public Works Contracts

Date: 6/2/16

APPROVED AS TO FORM

Jan I. Goldsmith, City Attorney

By Christina L. Rae

Print Name: Christina L. Rae

Deputy City Attorney

Date: 6/6/16

CONTRACTOR

By _____

Print Name: Michael Hall

Title: Chief Operating Officer

Date: April 27, 2016

City of San Diego License No.: B2004004791

State Contractor's License No.: 751343

DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) REGISTRATION NUMBER: 1000000191

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 American 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.

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:

_____

(Name of Project or Task)

as particularly described in said contract and identified as Bid No. _____ ; SAP No. (WBS/IO/CC) _____; 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 _____, _____.

_____ Contractor

by

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

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**

C. **EQUAL BENEFITS ORDINANCE - CERTIFICATION OF COMPLIANCE**

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 _____ as Principal, and

_____ 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

_____

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 _____ day of _____, 20_____

_____ (SEAL)	_____ (SEAL)
(Principal)	(Surety)
By: _____	By: _____
(Signature)	(Signature)

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

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:_____

Certified By _____ Title _____

Name

_____ Date _____

Signature

USE ADDITIONAL FORMS AS NECESSARY

EQUAL BENEFITS ORDINANCE

CERTIFICATION OF COMPLIANCE

For additional information, contact:
CITY OF SAN DIEGO
EQUAL BENEFITS PROGRAM
202 C Street, MS 9A, San Diego, CA 92101

COMPANY INFORMATION	
Company Name:	Contact Name:
Company Address:	Contact Phone:
	Contact Email:

CONTRACT INFORMATION	
Contract Title:	Start Date:
Contract Number (if no number, state location):	End Date:

SUMMARY OF EQUAL BENEFITS ORDINANCE REQUIREMENTS

The Equal Benefits Ordinance [EBO] requires the City to enter into contracts only with contractors who certify they will provide and maintain equal benefits as defined in SDMC §22.4302 for the duration of the contract. To comply:

- Contractor shall offer equal benefits to employees with spouses and employees with domestic partners.
  - Benefits include health, dental, vision insurance; pension/401(k) plans; bereavement, family, parental leave; discounts, child care; travel/relocation expenses; employee assistance programs; credit union membership; or any other benefit.
  - Any benefit not offer an employee with a spouse, is not required to be offered to an employee with a domestic partner.
- Contractor shall post notice of firm's equal benefits policy in the workplace and notify employees at time of hire and during open enrollment periods.
- Contractor shall allow City access to records, when requested, to confirm compliance with EBO requirements.
- Contractor shall submit *EBO Certification of Compliance*, signed under penalty of perjury, prior to award of contract.

NOTE: This summary is provided for convenience. Full text of the EBO and Rules Implementing the EBO are available at *www.sandiego.gov/administration.*

CONTRACTOR EQUAL BENEFITS ORDINANCE CERTIFICATION

Please indicate your firm's compliance status with the EBO. The City may request supporting documentation.

☐ I affirm **compliance** with the EBO because my firm *(contractor must select one reason):*

- ☐ Provides equal benefits to spouses and domestic partners.
- ☐ Provides no benefits to spouses or domestic partners.
- ☐ Has no employees.
- ☐ Has collective bargaining agreement(s) in place prior to January 1, 2011, that has not been renewed or expired.

☐ I request the City's approval to pay affected employees a cash equivalent in lieu of equal benefits and verify my firm made a reasonable effort but is not able to provide equal benefits upon contract award. I agree to notify employees of the availability of a cash equivalent for benefits available to spouses but not domestic partners and to continue to make every reasonable effort to extend all available benefits to domestic partners.

It is unlawful for any contractor to knowingly submit any false information to the City regarding equal benefits or cash equivalent associated with the execution, award, amendment, or administration of any contract. [San Diego Municipal Code §22.4307(a)]
Under penalty of perjury under laws of the State of California, I certify the above information is true and correct. I further certify that my firm understands the requirements of the Equal Benefits Ordinance and will provide and maintain equal benefits for the duration of the contract or pay a cash equivalent if authorized by the City.

Name/Title of Signatory	Signature	Date

FOR OFFICIAL CITY USE ONLY

Receipt Date: EBO Analyst: □ Approved □ Not Approved – Reason:

(Rev 02/15/2011

City of San Diego

CITY CONTACT: Juan Espindola **Contract Specialist**, **Email**: JEEspindola@sandiego.gov
Phone No. (619) 533-4491, **Fax No.** (619) 533-3633

ADDENDUM "C"

FOR

FIRE STATION NO. 5

BID NO.: **K-16-6141-DBB-3-C-A**
SAP NO. (WBS/IO/CC): **S-00788**
CLIENT DEPARTMENT: **1912**
COUNCIL DISTRICT: **3**
PROJECT TYPE: **BC**

BID DUE DATE:

2:00 PM
APRIL 11, 2016
CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
1010 SECOND AVENUE, 14th FLOOR, MS 614C
SAN DIEGO, CA 92101

A. CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

B. BIDDER's QUESTIONS

Questions pertaining to Scope or Specifications

Q1. Spec section for Mineral Fiber Cement Siding 07 46 46, but not referenced on the drawings.

A1. The mineral fiber cement siding was eliminated and replaced with the asphalt shingles.

Q2. Spec 03 35 43 section 2.3 "aggregate" calls for ¾" smooth maximum aggregate size selected by City. Is it the intent to have finish floor type CS-1 as a seeded, polished finish or is the ¾" rock mix design acceptable?

A2. The 3/4" rock mix design is acceptable.

C. CLARIFICATIONS

1. The project must meet LEED Silver at a minimum. Refer to spec section 01 33 29.

2. See Development Services Department's Building Newsletter 17-6 for list of Structural Steel approved by the City of San Diego.

3. Acrylic finish stucco does not require painting.

4. City of San Diego is not responsible for procuring a testing laboratory for any materials. Prime contractor is solely responsible for procuring, coordination, and compensation of testing laboratories.

James Nagelvoort, Director
Public Works Department

Dated: *April 5, 2016*
San Diego, California

JN/RWB/lji

City of San Diego

CITY CONTACT: Juan Espindola **Contract Specialist, Email:** JEEspindola@sandiego.gov
Phone No. (619) 533-3491, **Fax No.** (619) 533-3633

ADDENDUM "B"

FOR

FIRE STATION NO. 5

BID NO.:	**K-16-6141-DBB-3-C-A**
SAP NO. (WBS/IO/CC):	**S-00788**
CLIENT DEPARTMENT:	**1912**
COUNCIL DISTRICT:	**3**
PROJECT TYPE:	**BC**

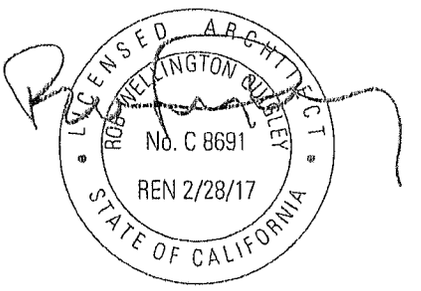
BID DUE DATE:

2:00 PM
APRIL 11, 2016
CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
1010 SECOND AVENUE, 14th 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 and Registered Architect:

1) Registered Architect — 3-29-16 Date — Seal:



2) For City Engineer — 3/30/16 Date — Seal:

The following Registered Mechanical Engineer and Registered Structural Engineer for this project have renewed their licenses as shown below:

3) Registered Mechanical Engineer — 03/29/2016 Date — Seal:

4) Registered Structural Engineer (Civil) — 03/30/2016 Date — Seal:

This signature is valid for structural construction documents for Fire Station 5 dated 2/16/16.

CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

A. BIDDER's QUESTIONS

Question pertaining to Terms and Conditions

Q1. Drawing D-2 Keynote #10 calls for relocating existing palm trees. Relocating trees this tall is very difficult next to a street because there is no room for guy wires to hold tree in place until rooting is established. Please clarify if a box tree can be provided in lieu of trying to relocate and provide the size of box tree to be used in this location. See A1.0 for the new locations.

A1. If staking support is pursued by contractor and/or recommended by the arborist, we recommend utilizing the space in the planted parkway as the palms are proposed for areas not adjacent to street parking. If City approves utilizing new trees in lieu of saving the existing, then the new palms would need to be consistent with the heights of the existing palms. Box size would not be the deciding factor; new trees would be required to have a MINIMUM of 20ft brown trunk height.

Q2. Drawing page E-4T note #6 "refer to mechanical plans", there are no mechanical plans. Please clarify or provide mechanical plans.

A2. The note is incorrect. There are no Mechanical Plans.

Q3. Drawing D-2 Keynote #8 calls for relocating existing power pole. Drawing page E1.3 keynote #10 calls for pole to be removed. Please confirm pole is to be removed.

A3. The pole is to be removed per the electrical drawings.

Q4. Civil sheet C-1 item #9 calls for stainless steel detectable warning tile. Stainless steel tiles are no longer made and per City of San Diego Memorandum Composite CIP detectable warning tiles are acceptable. Please confirm composite cast in place detectable warning tiles are acceptable replacement for stainless steel.

A4. City of San Diego standard drawing no. SDG-130 has an option for a composite detectable warning tile. The stainless steel is not required and can be substituted with the composite material.

Q5. Drawing sheet A0.3 floor finish type CS-1: calls for "Exposed" concrete structural slab, Stained Ground & Polished. Scofield 'Storm Cloud' # 3055". Scofield Storm Cloud is an integral color, please confirm you want both integral color and stained concrete for this CS-1 floor type.

A5. Storm Cloud #3055 is a "Formula One Liquid Dye Concentrate" designed to be applied to the concrete. It is not integral color.

Q6. Plan Sheet A-2.0 Sprung Structure - Note 1 states in part "Apparatus Structure Foundation and Contents are to be plan checked under a separate permit through the City of San Diego by the Contractors Licensed CA Engineer" and Note 7 states in part "to be erected in existing asphalt parking lot, provide an asphalt foundation type using earth anchors ..." Sprung Structures does not provide foundation design or calculations.

A6. Correct. Contractor responsible for providing all information required by the City for the Sprung Structure Permit. This includes any design consultants required.

Q7. Is the Contractor required to provide geotechnical criteria for the Sprung Structure foundation design?

A7. If required by the City. A limited geotechnical analysis of the parking lot was done and is available.

Q8. Similar to Q1 is the Contractor required to provide mechanical, design consultants to design the vehicle exhaust extraction duct shown on 1/A2?

A8. The Vehicle Exhaust system has already been designed by the Plymovent representative noted in the plans.

Q9. Is the Contractor required to provide plumbing design consultants?

A9. No plumbing design consultant is required. Sheet E-4T incorrectly references plumbing design.

Q10. Sheet E-4T shows electrical for washer/dryer and note #4 states connection complete" but no mention of what washer and dryer to install and no plumbing drawings showing water, water heater, or waste lines. There are no connection points for water or sewer. Please clarify information on washer and dryer. If there is a washer/Dryer, please provide POC for water and sewer with invert elevations.

A10. The note reference to a washer & dryer is incorrect. There are no washers or dryers.

Q11. Sheet A-2.0 calls for lockers provided by owner, installed by Contractor. Please provide type of locker and hardware required to install them.

A11. As noted, the lockers are to be relocated from the existing fire station. Contractor to co-ordinate with the owner which and how many lockers are to be relocated.

Q12. Drawing A1.0 shows two temporary power poles but no point of connection. Please provide point of connection for power for this site.

A12. Refer to the Electrical Plans for the Temporary Site for electrical requirements. The electrical service is to be provided from the existing adjacent building.

Q13. The plumbing fixture schedule calls out Rood Drain/overflow drains but I don't see them located on the P-sheets or anywhere else on the plans. If you can please confirm that this item will or will not be used.

A13. Confirmed, roof drainage is provided by gutters and downspouts. Gutters and downspouts are shown on the Architectural plans.

Q14. At the temp building, drawing E-3T keynote 2 states include an allowance for (12) 30' poles. The site plan shows 2 poles, 12 poles seems excessive. In order to provide an accurate bid with this many poles, we need to know the location of these poles. Hills, bushes, trees, rocks, etc. all play in the pricing of placing a pole. Please clarify the path of these 12 poles and locations.

A14. Bid to be based on note number 2, the allowance to be based on (12) twelve poles. The location for service connection will need to be coordinated during construction.

Q15. Drawing page E5.3 states '84' modules, E3.4 states '36', please clarify which is correct.

A15. E3.4 is correct with 36 modules.

Q16. Drawing page E5.3 states '6' strings, and E3.4 states '3', please clarify which is correct.

A16. E3.4 is correct with 3 strings

Q17. E5.3 states '14' modules per string, and E3.4 states '12', please clarify which is correct.

A17. E3.4 is correct with 12 modules per string.

Q18. On page 98 (in pdf file) of the geotechnical report it states "This report is intended for design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas."

A18. This is a standard geotechnical note. Additional evaluations would only be required if the City determined it was needed during construction.

Q19. The soils report provides recommendations to the designers for development of the plans and specifications. It appears the City and its designers have provided a design for permanent site. Is the Contractor required to hire its own geotechnical consultant to make recommendations for the permanent site construction or do we bid the plans and specifications provided by the City?

A19. Bid the plans as provided. Additional evaluations would only be required if the City determined it was needed during construction.

Q20. Page 133 (in pdf file) of the geotechnical report is recommendations for Temporary Site. This indicates that the City consultant understands pad preparation and foundation design for temporary sprung structure will be provided by Contractor. The report also questions the "long term" use of the existing asphalt for fire trucks. The plans provided by the City are very clear to erect structure on existing asphalt parking lot. Is the Contractor required to hire a geotechnical consultant and structural engineer to design foundations for sprung structures for the permitting process or should we bid the plans and specifications provided by the City? Who is responsible if the existing paving fails from use as temporary fire station apparatus parking?

A20. Contractor is responsible for providing all information required by the City for the Sprung Structure Permit. This includes any design consultants required. Plans call for the parking lot to be repaired at the end of the contract.

B. CLARIFICATIONS

1. Sheets 36907-55-D thru 36907-86-D, signed by Jean M Libby, Registered Professional Engineer, have been renewed and the current Expiration Date is 3/31/17.

2. Sheets 36907-119-D thru 36907-132-D and sheets 36907-135-D thru 36907-144-D, signed by Roy C. Campbell, Registered Professional Engineer, have been renewed and the current Expiration Date is 6/30/17.

James Nagelvoort, Director
Public Works Department

Dated: *March 30, 2016*
San Diego, California

JN/RWB/lji

City of San Diego

CITY CONTACT: Juan Espindola, **Contract Specialist**, **Email**: JEEspindola@sandiego.gov
Phone No. (619) 533-4491, **Fax No.** (619) 533-3633

ADDENDUM "A"

FOR

FIRE STATION NO. 5

BID NO.: **K-16-6141-DBB-3-C-A**
SAP NO. (WBS/IO/CC): **S-00788**
CLIENT DEPARTMENT: **1912**
COUNCIL DISTRICT: **3**
PROJECT TYPE: **BC**

BID DUE DATE:

2:00 PM
APRIL 11, 2016
CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
1010 SECOND AVENUE, 14th FLOOR, MS 614C
SAN DIEGO, CA 92101

A. CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

THE SUBMITTAL DATE FOR THIS PROJECT HAS BEEN **EXTENDED AS STATED ON THE COVER PAGE.**

James Nagelvoort, Director
Public Works Department

Dated: *March 25, 2016*
San Diego, California

JN/RWB/lji

Bid Results for Project Fire Station No. 5 (K-16-6141-DBB-3-C-A)
Issued on 03/03/2016
Bid Due on April 11, 2016 2:00 PM (Pacific)
Exported on 04/11/2016

VendorID	Company Name	Address	City	ZipCode	Country	Contact	Phone	Email	Vendor Type
286976	**Erickson-Hall Construction Co.**	500 Corporate Dr	Escondido	92029	United States	Abigail Benson	760-796-7700 ext. 137	abenson@ericksonhall.com	PQUAL,Local

Respondee	Respondee Title	Respondee Phone	Respondee Email
David M. Erickson	President	760-796-7700 ext. 107	abenson@ericksonhall.com

Bid Format	Submitted Date	Status	Confirmation #	Ranking
Electronic	April 11, 2016 1:56:18 PM (Pacific)	Submitted	76345	0

Attachments		
File Title	File Name	File Type
pdf	Contractors Certification of Pending Actions.pdf	General Attachments
pdf	Equal Benefits Ordinance.pdf	General Attachments
pdf	Bid Bond with Acknowledgement.pdf	Bid Bond

Line Items							
Item Num	Section	Item Code	Description	Unit of Measure	Quantity	Unit Price	Line Total
1	Main Bid	236220	Construction of Fire Station No. 5 and Related Site Improvements, and demolition the existing Fire Station at 3902 Ninth Avenue, San Diego CA, 92103	LS	1	$5,126,399.00	$5,126,399.00
2	Main Bid	236220	Fire Station No. 5 Temporary Facility at 4311 Thire Ave.San Diego CA. 92103	LS	1	$250,000.00	$250,000.00
3	Main Bid	236220	Building Permits for Permanent and Temporary Station: Mechanical, Plumbing and Electrical and Fees Related to Fuel Tank Permit, Including City of San Diego, Water & Sewer Capacities and Connection Fees-Type I Allowance.	AL	1	$100,000.00	$100,000.00
4	Main Bid	238210	Potovoltic Solar Panels at Roof Installation- Type I Allowance.	AL	1	$100,000.00	$100,000.00
5	Main Bid	238210	SDG&E Service Fee, Dry Utilities Connections, Pack Bell, AT&T and Time Warner-Type I Allowance.	AL	1	$59,101.00	$59,101.00
6	Main Bid	541330	Water Pollution Control Program Development	LS	1	$1,500.00	$1,500.00
7	Main Bid	236220	Water Pollution Control Program Impementation	LS	1	$8,500.00	$8,500.00
8	Main Bid	236220	FF&E. (Temporary and Permanent Facility) Type I Allowance.	AL	1	$120,000.00	$120,000.00
9	Main Bid	524126	Bond (Payment and Performance)	LS	1	$47,500.00	$47,500.00
10	Main Bid		Field Orders - Type II Allowance	AL	1	$335,000.00	$335,000.00
						Subtotal	**$6,148,000.00**
						Total	**$6,148,000.00**

Subcontractors									
Name	Description	License Num	Amount	Type	Address	Address 2	City	ZipCode	Country
Sierra Pacific West, Inc.	Demo/Earthwork	597852	$82,000.00	CAU,FEM,WOSB	P.O. Box 231640		Encinitas	92023	United States
Southwest Door & Frame	Doors/Frames/Hardware	866133	$46,775.00		6251 Schaefer Ave		Chino	91710	United States
Spacesaver Intermountain LLC	Lockers	981328	$42,268.00	CADIR	8969 Kenamar Drive	Suite 101	San Diego	92121	United States
Tile/Marble Technology Corp	Tile	641825	$40,695.00	WOSB	11211 Sorrento Valley Road, Suite N		San Diego	92121	United States
Stratton and Bratt Landscapes LLC	Landscape	1010579	$53,013.00		754 West 700 South		Pleasant Grove	84062	United States
Specialized Painting	Painting	641031	$44,000.00		530 W. Central Ave, Ste A		Brea	92821	United States
A-1 Fire Protection, Inc.	Fire Sprinklers	388358	$53,000.00	CAU,FEM,ELBE,PQUAL,WBE,WOSB	8655 Miramar Place		San Diego	92121	United States
Arce Custom Cabinets, Inc.	Casework	930618	$109,022.00	LAT,FEM,SLBE,MBE,CADIR,SDB	8845 Winter Gardens Blvd		Lakeside	92040	United States
Calhoun Electric Inc	Electrical	952493	$740,000.00	CADIR,CAU,ELBE,MALE,PQUAL	1545 Simpson Way		Escondido	91941	United States
Tiffany Structures	Sprung Structures	977563	$37,720.00		PO Box 3640		Ramona	92065	United States

Challenger Sheet Metal	Sheet Metal	525782	$119,000.00		9353 Abraham Way		Santee	92071	United States
CTE	Inspection	2665	$33,102.00		1441 Montiel Road		Escondido	92026	United States
AAIR Purification System	Vehicle Exhaust	621360	$53,601.00		9040 Kenamar Drive	Ste 402	San Diego	92121	United States
South Bay Mechanical	HVAC	901161	$158,910.00		2137 Wilson Ave		National City	91950	United States
Montgomery Construction Services, Inc.	Building Concrete	928118	$158,140.00	ELBE,PQUAL,DBE,MBE,CADIR,SDB	123 Worthington Street	Suite 205	Spring Valley	91977	United States
Premier Roofing CA, Inc.	Roofing	715667	$52,314.00		9054 Olive Drive		Spring Valley	91977	United States
West Coast Iron, Inc	Structural Steel	574017	$90,130.00		9302 Jamacha Rd		Spring Valley	91977	United States
R & M Plumbing Contractors Inc.	Plumbing/ Site Utilities	956104	$330,000.00	ELBE	8825 Diamondback Dr.		Santee	92071	United States
EL Hobbs Inc.	Plaster	777073	$107,652.00		PO Box 966		El Cajon	92022	United States
Schindler Elevator Corporation	Elevator	375733	$84,163.00		9810 Summer Ridge Rd Ste 140		San Diego	92121	United States
Tubbs Enterprises, Inc.	Gypsum Board	314739	$121,780.00	CADIR	2620 Aurora Glen		Escondido	92027	United States
D & D Concrete Construction Inc	Site Concrete	595329	$140,572.00		13795 Bliasdell201		Poway	92064	United States
Peterson Hydraulics, Inc.	Fueling System	631515	$82,735.00		1653 W El Segundo Blvd.		Gardena	90249	United States
Core Contracting, Inc.	Rough Carpentry	905751	$494,866.00		2336 La Miranda Dr, Suite 300		Vista	92081	United States
Empire Contract Glazing, Inc.	Glazing	975003	$132,786.00		9175 Chesapeake Drive		San Diego	92123	United States
Johasee Rebar Inc.	Reinforcing Steel	763448	$35,135.00		18059 Rosedale Highway		Bakersfield	93312	United States

Prime Self-Performance
WAIVED (CLASS B LICENSE)

BID BOND

See Instructions to Bidders, Bidder Guarantee of Good Faith (Bid Security)

KNOW ALL MEN BY THESE PRESENTS,

That Erickson-Hall Construction Co. as Principal, and Travelers Casualty and Surety Company of America 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 No. 5

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 1st day of April, 20 16

Erickson-Hall Construction Co. (SEAL)	Travelers Casualty and Surety Company of America (SEAL)
(Principal)	(Surety)
By: _____ CEO President	By: _____
(Signature)	Maria Guise, Attorney-in-Fact (Signature)

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT **CIVIL CODE § 1189**

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 Orange)

On APR 01 2016 before me, Rhonda C. Abel, Notary Public,
Date *Here Insert Name and Title of the Officer*

personally appeared Maria Guise
Name(s) of Signer(s)

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.

RHONDA C. ABEL
COMM. # 2051838
NOTARY PUBLIC - CALIFORNIA
ORANGE COUNTY
COMM. EXPIRES DEC. 14, 2017

Signature _____
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: _____ Document Date: _____
Number of Pages: _____ Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____	Signer's Name: _____
☐ Corporate Officer — Title(s): _____	☐ Corporate Officer — Title(s): _____
☐ Partner — ☐ Limited ☐ General	☐ Partner — ☐ Limited ☐ General
☐ Individual ☒ Attorney in Fact	☐ Individual ☐ Attorney in Fact
☐ Trustee ☐ Guardian or Conservator	☐ Trustee ☐ Guardian or Conservator
☐ Other: _____	☐ Other: _____
Signer Is Representing: _____	Signer Is Representing: _____

TRAVELERS

POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 230312 **Certificate No.** 006578175

KNOW ALL MEN BY THESE PRESENTS: That Farmington Casualty Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company are corporations duly organized under the laws of the State of Connecticut, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc., is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

Jeri Apodaca, Rhonda C. Abel, Kim Luu, Mike Parizino, Rachelle Rheault, James A. Schaller, Heather Saltarelli, and Maria Guise

of the City of Newport Beach, State of California, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 29th day of December, 2015.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company
St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

State of Connecticut
City of Hartford ss.

By: _____
Robert L. Raney, Senior Vice President

On this the 29th day of December, 2015, before me personally appeared Robert L. Raney, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2016.

MARIE C. TETREAULT NOTARY PUBLIC CONNECTICUT

Marie C. Tetreault
Marie C. Tetreault, Notary Public

58440-8-12 Printed in U.S.A.

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, Kevin E. Hughes, the undersigned, Assistant Secretary, of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this _____ day of APR 01 2016, 20 __.

Kevin E. Hughes, Assistant Secretary

To verify the authenticity of this Power of Attorney, call 1-800-421-3880 or contact us at www.travelersbond.com. Please refer to the Attorney-In-Fact number, the above-named individuals and the details of the bond to which the power is attached.

WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

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: Erickson-Hall Construction Co.

Certified By David M. Erickson Title President

Name

Signature Date April 11, 2016

USE ADDITIONAL FORMS AS NECESSARY

EQUAL BENEFITS ORDINANCE
CERTIFICATION OF COMPLIANCE

For additional information, contact:
CITY OF SAN DIEGO
EQUAL BENEFITS PROGRAM
202 C Street, MS 9A, San Diego, CA 92101

COMPANY INFORMATION

Company Name: Erickson-Hall Construction Co.	Contact Name: David M. Erickson
Company Address: 500 Corporate Drive	Contact Phone: 760-796-7700
Escondido, CA 92029	Contact Email: 760-796-7750

CONTRACT INFORMATION

Contract Title:	Start Date:
Contract Number (if no number, state location):	End Date:

SUMMARY OF EQUAL BENEFITS ORDINANCE REQUIREMENTS

The Equal Benefits Ordinance [EBO] requires the City to enter into contracts only with contractors who certify they will provide and maintain equal benefits as defined in SDMC §22.4302 for the duration of the contract. To comply:

- Contractor shall offer equal benefits to employees with spouses and employees with domestic partners.
  - Benefits include health, dental, vision insurance; pension/401(k) plans; bereavement, family, parental leave; discounts, child care; travel/relocation expenses; employee assistance programs; credit union membership; or any other benefit.
  - Any benefit not offer an employee with a spouse, is not required to be offered to an employee with a domestic partner.
- Contractor shall post notice of firm's equal benefits policy in the workplace and notify employees at time of hire and during open enrollment periods.
- Contractor shall allow City access to records, when requested, to confirm compliance with EBO requirements.
- Contractor shall submit *EBO Certification of Compliance*, signed under penalty of perjury, prior to award of contract.

NOTE: This summary is provided for convenience. Full text of the EBO and Rules Implementing the EBO are available at *www.sandiego.gov/administration.*

CONTRACTOR EQUAL BENEFITS ORDINANCE CERTIFICATION

Please indicate your firm's compliance status with the EBO. The City may request supporting documentation.

☒ I affirm **compliance** with the EBO because my firm *(contractor must select one reason):*

- ☒ Provides equal benefits to spouses and domestic partners.
- ☐ Provides no benefits to spouses or domestic partners.
- ☐ Has no employees.
- ☐ Has collective bargaining agreement(s) in place prior to January 1, 2011, that has not been renewed or expired.

☐ I request the City's approval to pay affected employees a cash equivalent in lieu of equal benefits and verify my firm made a reasonable effort but is not able to provide equal benefits upon contract award. I agree to notify employees of the availability of a cash equivalent for benefits available to spouses but not domestic partners and to continue to make every reasonable effort to extend all available benefits to domestic partners.

It is unlawful for any contractor to knowingly submit any false information to the City regarding equal benefits or cash equivalent associated with the execution, award, amendment, or administration of any contract. [San Diego Municipal Code §22.4307(a)]
Under penalty of perjury under laws of the State of California, I certify the above information is true and correct. I further certify that my firm understands the requirements of the Equal Benefits Ordinance and will provide and maintain equal benefits for the duration of the contract or pay a cash equivalent if authorized by the City.

David M. Erickson, President		4/11/2016
Name/Title of Signatory	Signature	Date

FOR OFFICIAL CITY USE ONLY

Receipt Date: EBO Analyst: ☐ Approved ☐ Not Approved – Reason:

(Rev 02/15/2011