City of San Diego

CONTRACTOR'S NAME: EC Constructors, Inc.
ADDRESS: 9834 River Street, Lakeside, CA 92040
TELEPHONE NO.: (619) 440-7181 **FAX NO.:** (619) 440-7180
CITY CONTACT: Eleida Felix Yackel, Senior Contract Specialist, Email: EFelixYackel@sandiego.gov
Phone No. (619) 533-3449, Fax No. (619) 533-3633
R. Jadan / A. James / LJI

CONTRACT DOCUMENTS

ORIGINAL

FOR

FIRE STATION NO. 17

VOLUME 1 OF 2

BID NO.:	**K-16-6142-DBB-3**
SAP NO. (WBS/IO/CC):	**S-00783**
CLIENT DEPARTMENT:	**1912**
COUNCIL DISTRICT:	**9**
PROJECT TYPE:	**BC**

THIS CONTRACT IS 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
OCTOBER 20, 2015
CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
1010 SECOND AVENUE, 14th FLOOR, MS 614C
SAN DIEGO, CA 92101

City of San Diego

CONTRACTOR'S NAME:_____
ADDRESS:_____
TELEPHONE NO.:_____ **FAX NO.:**_____
CITY CONTACT: Eleida Felix Yackel, Contract Specialist, Email: EFelixYackel@sandiego.gov
Phone No. (619) 533-3449, Fax No. (619) 533-3633
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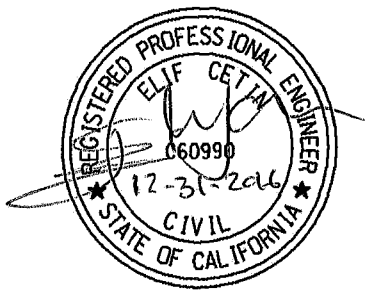
ENGINEER OF WORK

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

1) Registered Engineer/Architect CCBG ARCHITECTS INC. — 9.16.2015 Date — Seal:

2) For City Engineer — 9/16/2015 Date — Seal



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CITY OF SAN DIEGO, CALIFORNIA

NOTICE INVITING BIDS

1. **RECEIPT AND OPENING OF BIDS:** Bids will be received at the Public Works Contracts at the location, time, and date shown on the cover of these specifications for performing work on **FIRE STATION NO. 17** (Project).

2. **SUMMARY OF WORK:** The Work involves furnishing all labor, materials, equipment, services, and other incidental works and appurtenances for the construction of the Project as described in ATTACHMENT A.

3. **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.

4. **SUBCONTRACTING PARTICIPATION PERCENTAGES:**

4.1. The City has incorporated **mandatory** SLBE-ELBE subcontractor participation percentages to enhance competition and maximize subcontracting opportunities. For the purpose of achieving the mandatory subcontractor participation percentages, a recommended breakdown of the SLBE and ELBE subcontractor participation percentages based upon certified SLBE and ELBE firms has also been provided to achieve the mandatory subcontractor participation percentages:

1.	SLBE participation	**3.6%**
2.	ELBE participation	**10.0%**
3.	Total mandatory participation	**13.6%**

4.2. The Bidders are strongly encouraged to attend the Pre-Bid Meeting to better understand the Good Faith Effort requirements of this contract. See the City's document titled "SLBE Program, Instructions For Bidders Completing The Good Faith Effort Submittal" available at: http://www.sandiego.gov/eoc/

4.3. The Bid will be declared **non-responsive** if the Bidder fails the following mandatory conditions:

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

4.3.2. 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.

4.4. For additional Equal Opportunity Contracting Program requirements, see Attachment C.

5. PRE-BID MEETING:

5.1. There will be a Pre-Bid Meeting to discuss the scope of the Project, bidding requirements, pre-qualification process, and Equal Opportunity Contracting Program requirements and reporting procedures in the Public Works Contracts, Conference Room at 1010 Second Avenue, 14th Floor, San Diego, CA 92101 **at 10:00 A.M., on September 30, 2015.**

5.2. All potential bidders are encouraged to attend.

5.3. To request a copy of the agenda on an alternative format, or to request a sign language or oral interpreter for this meeting, call the Public Works Contracts at (619) 533-3450 at least 5 Working Days prior to the Pre-Bid Meeting to ensure availability.

6. CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM:

6.1. **Prior** to the Award of the Contract or each Task Order, you and your Subcontractors and Suppliers must register with the City's web-based vendor registration and bid management system, BidsOnlineTM hosted by PlanetBids System. For additional information go to:

http://www.sandiego.gov/purchasing/bids-contracts/vendorreg.shtml.

6.2. 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.

7. PRE-BID SITE VISIT: The prospective Bidders 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. A Pre-Bid Site Visit is offered when the details are provided as follows:

Time: **1:30 P.M.**
Date: **September 30, 2015**
Location: **4206 Chamoune Ave., San Diego, CA 92115**

8. 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.

9. 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.

9.1. 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.

9.1.1. 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.

9.1.2. 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.

9.2. 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.

9.3. 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.

9.3.1. 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.

9.4. **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.

9.5. **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.

9.6. **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.

9.7. **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."

9.8. **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.

9.9. **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.

9.9.1. 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.

10. INSURANCE REQUIREMENTS:

10.1. 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.

10.2. 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.

11. PREQUALIFICATION OF CONTRACTORS:

11.1. Contractors submitting Bid must be pre-qualified for the total amount proposed, inclusive of 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 will be deemed **non-responsive** and ineligible for award. Complete information and links to the online prequalification application are available at:

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

11.2. The completed application must be submitted online to the Public Works Contracts, Prequalification Program 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.

11.3. As a result of 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™.

12. 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

Title	Edition	Document Number
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		

13. **CITY'S RESPONSES AND ADDENDA:** The City at its option, may respond to any or all questions submitted in writing, via letter, or FAX in the form of an addendum. No oral comment 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 on the form provided for this purpose in the Bid.

14. **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.

15. **CONTRACT PRICING FORMAT:** This solicitation is for a Lump Sum contract with Unit Price provisions as set forth in the Bid Proposal Form(s), Volume 2.

16. **SUBMITTAL OF "OR EQUAL" ITEMS:** See Section 4-1.6, "Trade Names or Equals" in The WHITEBOOK and as amended in the SSP.

17. **AWARD PROCESS:**

17.1. The Award of this contract is contingent upon the Contractor's compliance with all conditions precedent to Award.

17.2. 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.

17.3. This contract will be deemed executed, and effective, only upon the signing of the Contract by the Mayor or designee of the City.

18. **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.

19. **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.

20. **SUBMISSION OF QUESTIONS:**

20.1. 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: [Contract Specialist listed on the front cover hereof]

OR:

Email address of the Contract Specialist listed on the front cover hereof.

20.2. Questions received less than 14 days prior to the date for opening of Bids may not be considered.

20.3. Clarifications deemed by the City to be material shall be issued by Addenda and uploaded to the City's online bidding service.

20.4. Only questions answered by formal written addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. It is the Bidder's responsibility to become informed of any Addenda that have been issued and to include all such information in its Bid.

21. **ELIGIBLE BIDDERS:** 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.

22. **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 with the Notice Inviting Bids and Contract forms.

23. PROPOSAL FORMS: Bid shall be made only upon the Bidding Documents i.e., Proposal form attached to and forming a part of the specifications. The signature of each person signing shall be in longhand.

23.1. Bidder shall complete and submit all pages in the "Bidding Document" Section (see Volume 2) as their Bid per the schedule given under "Required Documents Schedule," (see Volume 1). Bidder is requested to retain for their reference other portions of the Contract Documents that are not required to be submitted with the Bid. The entire specifications for the bid package do not need to be submitted with the bid.

23.2. The City may require any Bidder to furnish a statement of experience, financial responsibility, technical ability, equipment, and references.

23.3. Bids and certain other forms and documents as specified in the Volume 2 of 2 of the Contract Documents shall be enclosed in a sealed envelope and shall bear the title of the work and name of the Bidder and the appropriate State Contractors License designation which the Bidder holds.

23.4. Bids may be withdrawn by the Bidder prior to, but not after, the time fixed for opening of Bids.

24. BIDDER'S GUARANTEE OF GOOD FAITH (BID SECURITY):

24.1. 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.

24.2. 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.

24.3. 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.

24.4. A Bid received without the specified bid security may be rejected as **non-responsive**.

25. AWARD OF CONTRACT OR REJECTION OF BIDS:

25.1. This contract may be awarded to the lowest responsible and reliable Bidder.

25.2. Bidders shall complete the entire Bid schedule (also referred to as "schedule of prices" or Proposal form). Incomplete price schedules will be rejected as being non-responsive.

25.3. The City reserves the right to reject any or all Bids, and to waive any informality or technicality in Bids received and any requirements of these specifications as to bidding procedure.

25.4. Bidders will not be released on account of their errors of judgment. Bidders may be released only upon receipt by the City from the Bidder within 3 Working Days, excluding Saturdays, Sundays, and state holidays, after the opening of Bids, of written notice which includes proof of honest, credible, clerical error of material nature, free from fraud or fraudulent intent, and of evidence that reasonable care was observed in the preparation of the Bid.

25.5. 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 section 22.3017 of the San Diego Municipal Code.

25.6. The City of San Diego will not discriminate with regard to race, religious creed, color, national origin, ancestry, physical handicap, marital status, sex or age, in the award of contracts.

25.7. Each Bid package properly executed as required by these specifications shall constitute a firm offer, which may be accepted by the City within the time specified in the Proposal.

25.8. The City reserves the right to evaluate all Bids and determine the lowest Bidder on the basis of any proposed alternates, additive items or options, at its discretion that will be disclosed in the Volume 2 of 2.

26. BID RESULTS:

26.1. The Bid opening by the City 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 public announcement will be posted in the City's web page http://www.sandiego.gov/cip/index.shtml, with the name of the newly designated Apparent Low Bidder.

26.2. To obtain Bid results, either attend Bid opening, review the results on the City's web site, or provide a self-addressed, stamped envelope, referencing Bid number, and Bid tabulation will be mailed to you upon verification of extensions. Bid results cannot be given over the telephone.

27. THE CONTRACT:

27.1. 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.

27.2. 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.

27.3. 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.

27.4. 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.

27.5. 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. 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.

28. 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.

29. CITY STANDARD PROVISIONS: This contract is subject to the following standard provisions. See The WHITEBOOK for details.

29.1. The City of San Diego Resolution No. R-277952 adopted on May 20, 1991 for a Drug-Free Workplace.

29.2. The City of San Diego Resolution No. R-282153 adopted on June 14, 1993 related to the Americans with Disabilities Act.

29.3. The City of San Diego Municipal Code §22.3004 for Pledge of Compliance.

29.4. The City of San Diego's Labor Compliance Program and the State of California Labor Code §§1771.5(b) and 1776.

29.5. 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.

29.6. The City's Equal Benefits Ordinance (EBO), Chapter 2, Article 2, Division 43 of The San Diego Municipal Code (SDMC).

29.7. The City's Information Security Policy (ISP) as defined in the City's Administrative Regulation 90.63.

30. PRE-AWARD ACTIVITIES:

30.1. The selected contractor by the City to execute a contract for this Work shall provide the information required within the time specified in "Required Documents," of this bid package. Failure to provide the information within the time specified may result in the Bid being rejected as **non-responsive.**

30.2. If the Bid is rejected as non-responsive, the selected contractor by the City to execute a contract for this Work shall forfeit the required Bid. The decision that the selected contractor by the City to execute a contract for this Work is non-responsive for failure to provide the information required within the time specified shall be at the sole discretion of the City.

31. REQUIRED DOCUMENT SCHEDULE:

31.1. The Bidder's attention is directed to the City's Municipal Code §22.0807(e), (3)-(5) for important information regarding grounds for debarment for failure to submit required documentation.

31.2. The specified Equal Opportunity Contracting Program (EOCP) forms are available for download from the City's web site at:

http://www.sandiego.gov/eoc/forms/index.shtml

ITEM	WHEN DUE	FROM	DOCUMENT TO BE SUBMITTED
1.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Bid
2.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Bid Bond
3.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Non-collusion Affidavit to be Executed By Bidder and Submitted with Bid under 23 USC 112 and PCC 7106
4.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Contractors Certification of Pending Actions
5.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Equal Benefits Ordinance Certification of Compliance
6.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Form AA35 - List of Subcontractors
7.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Form AA40 - Named Equipment/Material Supplier List
8.	WITHIN 3 WORKING DAYS OF BID OPENING	ALL BIDDERS	SLBE Good Faith Efforts Documentation

ITEM	WHEN DUE	FROM	DOCUMENT TO BE SUBMITTED
9.	WITHIN 3 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	Form AA60 – List of Work Made Available
10.	WITHIN 3 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	Proof of Valid DBE-MBE-WBE-DVBE Certification Status e.g., Certs.
11.	PRIOR TO PRE-CONSTRUCTION MEETING	LOW BIDDER	Contractor's Experience and Past Project Documentation. See Sections 500 and 700
12.	PRIOR TO PRE-CONSTRUCTION MEETING	LOW BIDDER	• Manufacturer Certification per Section 500-1.1.2.1
13.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Names of the principal individual owners of the Apparent Low Bidder
14.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	If the Contractor is a Joint Venture: • Joint Venture Agreement • Joint Venture License
15.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Form BB05 - Work Force Report
16.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contract Forms - Agreement
17.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contract Forms - Payment and Performance Bond
18.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Certificates of Insurance and Endorsements
19.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractor Certification - Drug-Free Workplace

ITEM	WHEN DUE	FROM	DOCUMENT TO BE SUBMITTED
20.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractor Certification - American with Disabilities Act
21.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractors Standards - Pledge of Compliance

CONTRACT FORMS

AGREEMENT

CONSTRUCTION CONTRACT

This contract is made and entered into between THE CITY OF SAN DIEGO, a municipal corporation, herein called "City", and EC Constructors, Inc., herein called "Contractor" for construction of **Fire Station No. 17** Bid No. **K-16-6142-DBB-3** in the amount of Seven Million Eighty-Five Thousand Nine Hundred Nine Dollars and Zero Cents ($7,085,909.00), which is comprised of the Base Bid.

IN CONSIDERATION of the payments to be made hereunder and the mutual undertakings of the parties hereto, City and Contractor agree as follows:

1. The following are incorporated into this contract as though fully set forth herein:

   (a) The attached Faithful Performance and Payment Bonds.

   (b) The attached Proposal included in the Bid documents by the Contractor.

   (c) Reference Standards listed in the Notice Inviting Bids and the Supplementary Special Provisions (SSP).

   (d) That certain documents entitled **Fire Station No. 17**, on file in the office of the Public Works Department as Document No. **S-00783**, 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. 17**, Bid Number **K-16-6142-DBB-3,** San Diego, California.

3. For such performances, the City shall pay to Contractor the amounts set forth at the times and in the manner and with such additions or deductions as are provided for in this contract, and the Contractor shall accept such payment in full satisfaction of all claims incident to such performances.

4. No claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.

5. This contract is effective as of the date that the Mayor or designee signs the agreement.

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 _____
Albert P. Rechany
Deputy Director
Public Works Contracts

Date: 12/23/2015

APPROVED AS TO FORM

Jan I. Goldsmith, City Attorney

By _____

Print Name: Christina L. Rae
Deputy City Attorney

Date: 12/24/15

CONTRACTOR

By _____

Print Name: Sherri L. Summers

Title: CEO

Date: 11-30-15

City of San Diego License No.: B2012044182

State Contractor's License No.: 585677

CONTRACT FORMS

ATTACHMENTS

Executed in Triplicate

CONTRACT FORMS ATTACHMENTS
PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND

FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:

EC Constructors, Inc., a corporation, as principal, and Hartford Fire Insurance Company, a corporation authorized to do business in the State of California, as Surety, hereby obligate themselves, their successors and assigns, jointly and severally, to The City of San Diego a municipal corporation in the sum of Seven Million Eighty-Five Thousand Nine Hundred Nine Dollars and Zero Cents ($7,085,909.00), for the faithful performance of the annexed contract, and in the sum of Seven Million Eighty-Five Thousand Nine Hundred Nine Dollars and Zero Cents ($7,085,909.00), for the benefit of laborers and materialmen designated below.

Conditions:

If the Principal shall faithfully perform the annexed contract **Fire Station No. 17**, Bid Number **K-16-6142-DBB-3**, 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 Chapter 3 of Division 5 of Title I of the Government Code of the State of California or under the provisions of Section 3082 et seq. of the Civil Code of the State of California.

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

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

Dated November 24, 2015

Approved as to Form

Jan I. Goldsmith, City Attorney

By _____
Deputy City Attorney 12/24/15

Approved:

By _____
Albert P. Rechany
Deputy Director
Public Works Contracts

EC Constructors, Inc.
Principal

By _____

Sherri L. Summers, CEO
Printed Name of Person Signing for Principal

Hartford Fire Insurance Company
Surety

By _____
Charlotte Aquino, Attorney-in-fact

One Pointe Drive, 6th Floor
Local Address of Surety

Brea, CA 92821
Local Address (City, State) of Surety

(714) 674-1316
Local Telephone No. of Surety

Premium $ 73,815.00 PREMIUM IS FOR CONTRACT TERM AND SUBJECT TO ADJUSTMENT BASED ON FINAL CONTRACT PRICE

Bond No. 72BCSHG8080

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 San Diego

On NOV 24 2015 (Date) before me, Lilia Robinson (Insert Name of Notary exactly as it appears on the official seal), Notary Public,

personally appeared Charlotte Aquino (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.

Signature _____ (Signature of Notary Public) Lilia Robinson

LILIA ROBINSON
COMM. #2047750
NOTARY PUBLIC-CALIFORNIA
SAN DIEGO COUNTY
My Commission Expires
NOVEMBER 29, 2017

Place Notary Seal Above

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of the form to another 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: _____
- ☐ Individual
- ☐ Corporate Officer — Title(s): _____
- ☐ Partner ☐ Limited ☐ General
- ☑ Attorney in Fact
- ☐ Trustee
- ☐ Guardian or Conservator
- ☐ Other: _____

Signer is Representing:

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

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

Signer is Representing:

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

POWER OF ATTORNEY

Direct Inquiries/Claims to:
THE HARTFORD
BOND, T-4
One Hartford Plaza
Hartford, Connecticut 06155
call: **888-266-3488** *or fax:* **860-757-5835**

KNOW ALL PERSONS BY THESE PRESENTS THAT: **Agency Code: 72-160200**

- [X] **Hartford Fire Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- [X] **Hartford Casualty Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Accident and Indemnity Company**, a corporation duly organized under the laws of the State of Connecticut
- [ ] **Hartford Underwriters Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- [ ] **Twin City Fire Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Insurance Company of Illinois**, a corporation duly organized under the laws of the State of Illinois
- [ ] **Hartford Insurance Company of the Midwest**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Insurance Company of the Southeast,** a corporation duly organized under the laws of the State of Florida

having their home office in Hartford, Connecticut, (hereinafter collectively referred to as the "Companies") do hereby make, constitute and appoint, ***up to the amount of unlimited:***

Lawrence F. McMahon, James Baldassare Jr., Sarah Myers, Maria Guise, Lilia Robinson, Charlotte Aquino, Jennifer L. Clampert, Janice Martin
of
San Diego, CA

their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign its name as surety(ies) only as delineated above by ☒, and to execute, seal and acknowledge any and all bonds, undertakings, contracts and other written instruments 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, and as authorized by a Resolution of the Board of Directors of the Companies on August 1, 2009 the Companies have caused these presents to be signed by its Vice President and its corporate seals to be hereto affixed, duly attested by its Assistant Secretary. Further, pursuant to Resolution of the Board of Directors of the Companies, the Companies hereby unambiguously affirm that they are and will be bound by any mechanically applied signatures applied to this Power of Attorney.

Wesley W. Cowling, Assistant Secretary

M. Ross Fisher, Vice President

STATE OF CONNECTICUT
COUNTY OF HARTFORD } ss. Hartford

On this 12th day of July, 2012, before me personally came M. Ross Fisher, to me known, who being by me duly sworn, did depose and say: that he resides in the County of Hartford, State of Connecticut; that he is the Vice President of the Companies, the corporations described in and which executed the above instrument; that he knows the seals of the said corporations; that the seals affixed to the said instrument are such corporate seals; that they were so affixed by authority of the Boards of Directors of said corporations and that he signed his name thereto by like authority.

Kathleen T. Maynard
Notary Public
My Commission Expires July 31, 2016

CERTIFICATE

I, the undersigned, Vice President of the Companies, 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 still in full force effective as of November 24, 2015

Signed and sealed at the City of Hartford.

Gary W. Stumper, Vice President

CONTRACTOR CERTIFICATION

DRUG-FREE WORKPLACE

PROJECT TITLE: **Fire Station No. 17**

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;

EC Constructors, Inc.
(Name under which business is conducted)

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.

Signed Sherri L Summers

Printed Name Sherri L. Summers

Title CEO

CONTRACTOR CERTIFICATION

AMERICAN WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION

PROJECT TITLE: **Fire Station No. 17**

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;

EC Constructors, Inc.
(Name under which business is conducted)

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.

Signed Sherri L Summers

Printed Name Sherri L. Summers

Title CEO

CONTRACTOR CERTIFICATION

CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE

PROJECT TITLE: **Fire Station No. 17**

I declare under penalty of perjury that I am authorized to make this certification on behalf of EC Constructors, Inc., as Contractor, that 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.

Dated this 30th Day of November, 2015.

Signed Sherri L Summers

Printed Name Sherri L. Summers

Title CEO

AFFIDAVIT OF DISPOSAL

WHEREAS, on the _____ DAY OF _____, 2_____ the undersigned entered into and executed a contract with the City of San Diego, a municipal corporation, for:

Fire Station No. 17
(Name of Project or Task)

as particularly described in said contract and identified as Bid No. **K-16-6142-DBB-3;** SAP No. (WBS/IO/CC) **S-00783,** 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

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 4206 Chamoune Ave., San Diego, CA, 92115 and the construction of a (10,760 SF) new Permanent station at the same site location. The scope also, includes assembling temporary station components (located at 4000 41st Street, San Diego 92115), which consist of a (sprung structure and state approved trailer/coach with related site improvements) to accommodate the fire crew until the construction of the new Permanent station is completed. Once the new Permanent station is completed the fire fighters will move into the new facility. In addition to the scope of work, the temporary sprung structure and the trailer/coach to be moved to a storage within 30 miles radius from the no longer needed temporary station site location (The physical storage address will be provided by Fire department at a later time during the construction stage). Also, the majority of the related site improvements of the temporary site are to be demolished and removed, as noted in the plans. The entire scope of work is based on the entire contract documents such as but not limited to Contracts, addenda, drawings, specifications, reports, utility design documents, etc.

1.1. The Work shall be performed in accordance with:

1.1.1. The Notice Inviting Bids and Plans numbered **36906-1-D** through **36906-166-D**, inclusive.

2. **CONSTRUCTION COST:** The City's estimated construction cost for this contract is **$7,600,000**.

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

This project is located at:
Permanent Station: **4206 Chamoune Avenue, San Diego, CA 92115.**
Temporary Station: **4000 41st Street, San Diego, CA 92115**

4. **CONTRACT TIME:** The Contract Time for completion of the Work, including the plant establishment period, shall be **440 Working Days**.

5. **CONTRACTOR'S LICENSE CLASSIFICATION:** In accordance with the provisions of California Law, the Contractor shall possess valid appropriate license(s) at the time that the Bid is submitted. Failure to possess the specified license(s) shall render the Bid as **non-responsive** and shall act as a bar to award of the Contract to any Bidder not possessing required license(s) at the time of Bid.

5.1. The City has determined the following licensing classification for this contract:

- CLASS B

ATTACHMENT B

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ATTACHMENT C

EQUAL OPPORTUNITY CONTRACTING PROGRAM

EQUAL OPPORTUNITY CONTRACTING PROGRAM

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

INTENTIONALLY LEFT BLANK

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. You must perform, with your own organization, Contract work amounting to at least 50% of the base bid alone or base bid and any additive or deductive alternate(s) that together when added or deducted form the basis of award.

2. 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: (See Appendix C)

    1. Subgrade preparation and base course Report by Ninyo & Moore and Associates dated on November 6, 2012. For the Permanent Fire Station location.

    2. Report of Geotechnical Evaluation dated November 6, 2012 by Ninyo & Moore and Associates. For the Temporary Fire Station location.

    3. Report of Geotechnical Evaluation dated March 23, 2012 by Ninyo & Moore and Associates. For the Permanent Fire Station location.

5. The reports listed above are attached to the Contract appendices or visiting:

    ftp://ftp.sannet.gov/OUT/ECP/2-7%20SUBSURFACE%20DATA/

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

Pursuant to Division 3, Chapter 15 of the Business and Professions Code, the Contractor 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.

Monument Preservation will be performed by City Public Works Field Engineering Division (PW-FED) Field Survey Section on all Projects, unless permission is obtained for these services in writing by PW-FED.

The Contractor 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. The Agency (or the owner on a Private Contract) will:

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, and

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:

The Contractor shall be responsible for all surveying services or as may be specified in these special provisions.

Work shall be performed by a Licensed Surveyor.

The payment for survey services shall be included in the various Bid items unless a Bid item for Survey Service has been provided.

2-9.2.3 **Payment.** Payment for survey services shall be included in the lump sum Base Bid.

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

An adjacent City project is scheduled for construction approximately about the same time period in the vicinity of the adjacent alley to the Permanent Fire Station No.17. See Appendix "E" for approximate location. Coordinate the Work with the adjacent project as listed below:

a) Water & Sewer GJ 1041, Project Manager Regan Owen

2-15 **TECHNICAL STUDIES AND DATA.** To the City Supplement, ADD the following:

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

    1. Report of Asbestos dated July 15, 2014 by Environmental Services. (See Appendix I)

6. The report listed above is attached to the Contract appendices.

SECTION 4 - CONTROL OF MATERIALS

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

See Special Inspections on Sheet A-0.1 and S-1.1.

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.

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

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

The **90 working** days for the Plant Establishment Period are 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.

7-4 **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.

7-15 **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 will work with you to inform the public (which includes, but is not limited to, property owners, renters, homeowners, business owners, recreational users, and other community members and stakeholders) of construction impacts. Efforts by you to mitigate construction impacts by communicating with the public require close coordination and cooperation with the City.

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

   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 Public Contact Log located on the City's SDShare site:

   http://sdshare/forums/ecp/PITS/picr/Lists/Public%20Contact%20Log/AllItems.aspx.

4. You shall execute the Information Security Policy Acknowledgement Form - For Non-City Employees within 15 days of the award of the Contract if:

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

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

5. Electronic Communication.

   All inquiries and complaints will be logged in to the City's SDShare site within 24 hours of receipt of inquiries and complaints.

Any updates or a resolution of inquiries, and complaints shall be documented in the City's SDShare site within 24 hours.

Copies of email communications shall be saved, individually, on to the City's SDShare site as an Outlook Message Format (*.msg).

All graphics, photos, and other electronic files associated with the inquiries and or complaints shall be saved into the individual record.

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, 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 SDShare site 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 SDShare site copies of all written, electronic, and verbal communications and conversations with the public.

7-16.1.3 Weekly Updates Recipients. Submit a weekly correspondence with updates, traffic control issues and locations, lane closures, and any other pertinent information (with additional contact names given during award process) to the following recipients:

Elif Cetin, Senior Engineer, Ecetin@sandiego.gov

Rowaida Jadan, Project Engineer, Rjadan@sandiego.gov

Lauren Graham, Resident Engineer, LAGraham@sandiego.gov

7-16.2 Community Outreach Services.

7-16.2.1 Public Notice by Contractor.

1. Post Project Identification Signs in accordance with section 7-10.6.2

2. Notify businesses, institutions, property owners, residents or any other impacted stakeholders, within a minimum 300 feet 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, 1 ¼" 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 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, members of the media may show up at construction sites, uninvited. Members of the media (including, but not limited to newspaper, magazine, radio, 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 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 members of the media visits 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.

7-16.8 **Payment.** The Payment for the Community Outreach Service is included in the contract price.

7-20 **ELECTRONIC COMMUNICATION.** ADD the following:

Virtual Project Manager will be used on this contract.

SECTION 8 - FACILITIES FOR AGENCY PERSONNEL

8-2 **FIELD OFFICE FACILITIES.** To the City Supplement, ADD the following:

Provide a Class "D" Field Office.

SECTION 9 - MEASUREMENT AND PAYMENT

9-3.2 **Partial and Final Payment.** DELETE paragraph three in its entirety and SUBSTITUTE with the following:

Upon commencement of the Work, an escrow account shall be established in a financial institution chosen by you and approved by the City**.** As progress payments are made to you, the retention portion is deposited by the City into the Escrow account. Documentation for an Escrow payment must have an Escrow agreement signed by you, the City and the Escrow Agent. Upon completion of the contract the City notifies the Escrow agent in writing to release the funds to you. Only the designated representative of the City shall sign the request for the release of Escrow funds.

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

SECTION 212 - LANDSCAPE AND IRRIGATION MATERIALS

ADD:

212-3.2.2.3 **Trench Marker Tape.** To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

a) Trench marker tape shall be 6" wide and consist of a minimum 5.0 mil, five-ply 100% virgin polyethylene which is acid, alkaline and corrosion resistant. Elongation properties and tensile strength of not less than 7,800 psi shall be in accordance with ASTM D882-80A. The trench marker tape for water lines shall have a minimum 20 gauge solid aluminum foil core, adhered to a 2.55 mil polyethylene backing.

b) Tape color and legend shall be placed beneath the top protective layer subject to the following:

1. Blue with "Caution Potable Water Line Buried Below" for Water mainlines and over pipe sleeves.

2. Purple with "Caution Recycled/Reclaimed Water Line Buried Below" for recycled water irrigation mainlines.

3. Red with "Caution Electric Line Buried Below" for electrical lines servicing the irrigation system, including, but not limited to, 110/220v power to irrigation controllers and pumps, communication cables and irrigation direct burial control wires to remote control valves.

4. Green with "Caution Sewer Line Buried Below" for Sewer mainlines and over pipe sleeves.

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**	**306-1.9.21**
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**

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 Exemption** for **Fire Station No. 17** as referenced in the Contract Appendix. You must comply with all requirements of the **Notice of Exemption** 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)

TECHNICALS

TECHNICAL SPECIFICATIONS

CITY OF SAN DIEGO
FIRE STATION # 17
SAN DIEGO, CALIFORNIA

CONTRACT DOCUMENTS
July 16, 2015

CCBG Architects, Inc.
3677 Voltaire Street
San Diego, CA 92106
T: 619-234-2212
F: 619-234-2255

TECHNICAL SPECIFICATIONS
TABLE OF CONTENTS

CITY OF SAN DIEGO
FIRE STATION #17

END OF TABLE OF CONTENTS

SECTION 00 62 33

PRODUCTS FORM (LEED-NC v3.0)

Date: _____ Products Form Sheet Number: _____

PROJECT INFORMATION

Project: ***City of San Diego*** A/E Project Number: ***CCBG 1015***

Fire Station #17 Contract For: _____

To: _____

PRODUCT INFORMATION

Section No.: _____ Article/Paragraph: _____

Specification Title: _____

Product Name: _____

Product Description: _____

Trade Name: _____ Model No.: _____

Manufacturer: _____ Phone: _____

Manufacturer's Address: _____

Installer: _____ Phone: _____

Installer's Address: _____

Product Cost (Total Material): $_____

SECTION I - SUSTAINABLE SITES (SS) CREDIT CONTRIBUTION	
SS CREDIT 7.2 - HEAT ISLAND EFFECT, ROOF (*ROOFING PRODUCTS - Division 07*)	
Product data attached to Product Form?	[ ] Yes [ ] No [ ] N/A
Solar Reflectance Index (ASTM E1980)	
Low Slope ≤ 2:12: ≥ 0.78	[ ] Yes [ ] No [ ] N/A
Steep Slope > 2:12: ≥ 0.29	[ ] Yes [ ] No [ ] N/A
SECTION II - WATER EFFICIENCY (WE) CREDIT CONTRIBUTION	
WE PREREQUISITE 1 & WE CREDIT 3 - WATER USE REDUCTION (*Division 22 - Plumbing*)	
Toilet: *(attach Product Data)*	_____ gpf
Urinals: *(attach Product Data)*	_____ gpf
Showerhead: *(attach Product Data)*	_____ gpm
Lavatory Faucets: *(attach Product Data)*	_____ gpm
Kitchen/Break Room Faucets: *(attach Product Data)*	_____ gpm
Metering Faucets: *(attach Product Data)*	_____ gal / cy

SECTION III - ENERGY & ATMOSPHERE (EA) CREDIT CONTRIBUTION	
EA PREREQUISITE 2 – MINIMUM ENERGY PERFORMANCE	
Glass *(attach Product Data)*	
U value *(insert value)*	
SHGC *(insert value)*	
Wall Insulation *(attach Product Data)* R-value *(insert value)*	
Roof Insulation *(attach Product Data)* R-value *(insert value)*	
EA PREREQUISITE 3 – FUNDAMENTAL REFRIGERANT MANAGEMENT (*Division 23 - Mechanical)*	
Refrigerant (base)	
Ozone Depleting Potential (ODP) *(insert value)*	
Global Warming Potential (GWP) *(insert value)*	
SECTION IV - MATERIALS AND RESOURCES (MR) CREDIT CONTRIBUTION	
MR CREDIT 4 - RECYCLED CONTENT	
Post Consumer	_____%
Post Industrial	_____%
Third Party Certified?	[ ] Yes [ ] No [ ] N/A
MR CREDIT 5 – REGIONAL MATERIALS	
Manufacturing Location:	City: _____ State: _____ Country: _____
Distance to Jobsite (Air Miles per Google Earth)	_____Miles
Raw Material Harvest/Extraction Location (City, State, Country) (provide listing for each of the various components, if applicable)	City: _____ State: _____ Country: _____
Distance to Jobsite (Air Miles per Google Earth)	_____Miles
MR CREDIT 6 – RAPIDLY RENEWABLE MATERIALS	
Harvest Cycle	_____Years
Percent of Product	_____%

SECTION V - INDOOR ENVIRONMENTAL QUALITY (EQ) CREDIT CONTRIBUTION	
EQ CREDIT 4.1 - ADHESIVES AND SEALANT (INTERIOR USES ONLY *(see section 01 60 00)*	
Welding and Installation Adhesives (VOC Content)	_____g/L
Substrate Adhesives (VOC Content)	_____g/L
Sealants (VOC Content)	_____g/L
Sealant Primers (VOC Content)	_____g/L
Aerosol Adhesives (VOC Content)	_____% by weight
EQ CREDIT 4.2 - PAINTS AND COATINGS (INTERIOR USES ONLY *(see section 01 60 00_*	
Non-Flat (VOC Content)	_____g/L
Flat (VOC Content)	_____g/L
Meets GreenSeal Standard	[ ] Yes [ ] No [ ] N/A
EQ CREDIT 4.3 – FLOORING SYSTEMS *(see section 01 60 00)*	
Hard surface flooring compliant with Floor Score	[ ] Yes [ ] No [ ] N/A
Floor finishes (sealer/stain/finish) meet SCAQMD Rule 1113, (1/1/04)	[ ] Yes [ ] No [ ] N/A
Tile adhesives & grout meeting SCAQMD Rule 1168 (amended 1/7/05)	[ ] Yes [ ] No [ ] N/A
EQ CREDIT 4.4 - COMPOSITE WOOD AND AGRIBOARD*(see section 01 60 00)*	
Added Urea Formaldehyde	[ ] Yes [ ] No [ ] N/A

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

_____

_____

_____

Instructions for Completion

Date: Insert date submitted.

Products Form Sheet Number: Do not fill in this blank. This if for the reviewer's use in identifying each data sheet as they are received.

PROJECT INFORMATION

Project Name: As shown on the cover of the Technical Specifications and on the title sheet of the Drawings.

A/E Project Number: This is the ARCHITECT'S project number, as indicated on the cover of the Technical Specifications and on the title sheet of the Drawings.

Contract For: This is typically "New Construction," but; can also be for "Alterations," or "Additions" as applicable to the project.

To: This is the reviewer of the document. Insert Architect's Name, UNLESS otherwise directed to insert Contractor's name or Owner's name.

PRODUCT INFORMATION

Section No., Article/Paragraph, Specification Title: As shown on the specification for this product within the Technical Specifications.

Product Name: As shown on the specification for this product within the Technical Specifications. Do not put "trade name" information here.

Product Description: A general description of the product that explains usage of the product.

Trade Name: Manufacturer's name for product.

Model No.: Specific number given for the product by the manufacturer.

Manufacturer, Phone, Address: Company name of the manufacturer of the product and a phone number to contact the manufacturer. Provide manufacturer's home office. (Manufacturing location is requested under MR Credit 5.0)

Installer, Phone, Address: Company name of the installer of the product and a phone number to contact the installer. Location of installer's home office

Product Cost (Total Material): This information is required to properly calculate percentages for the LEED Points.

Information for Sections I, II, II, IV and V: Provide information as applicable to product. Mark items as "N/A" if not applicable to product.

Submitted by, etc.: Provide complete information to allow reviewer to contact submitter if there are any questions.

Attachments: Attach product data to substantiate information on this Data Sheet.

DOCUMENT 00 63 13

REQUEST FOR INFORMATION / INTERPRETATION

Project: ***City of San Diego*** R.F.I Number: _____

Fire Station #17 From: _____

To: _____ Date: _____

_____ A/E Project Number: ***CCBG 1015***

Specification Section: Paragraph: Drawing Reference: Detail

Request:

* Requested Date/Time for Response:

Signed by:

Response:

☐ Attachments

Response From: To: * Date Rec'd: * Date Ret'd:

Signed by:

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ File

* Contractor shall allow up to 5 working days review and response time for RFI'S, unless review is required of multiple consultants, then the review and response period shall be 7 working days. Electronic RFI's (in PDF format only) may be submitted by E-Mail. (See Section 01 26 13).

SECTION 00 63 25

SUBSTITUTION REQUEST
(After the Bidding Phase)

Project: ***City of San Diego***
Fire Station #17
To: _____
_____
Re: _____

Substitution Request Number: _____
From: _____
Date: _____
A/E Project Number: ***CCBG 1015***
Contract For: _____

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
Manufacturer: _____ Address: _____ Phone: _____
Trade Name: _____ Model No.: _____
Installer: _____ Address: _____ Phone: _____
History: ☐ New product ☐ 2-5 years old ☐ 5-10 years old ☐ More than 10 years old
Differences between proposed substitution and specified product: _____
_____
_____
☐ Point-by point comparative data attached – REQUIRED BY A/E

Reason for not providing specified item: _____
_____
Similar Installation:
Project: _____ Architect: _____
Address: _____ Owner: _____
_____ Date Installed: _____
Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____
_____

Savings to Owner for accepting substitution: _____ ($_____).
Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
- ***Proposed substitution will not impact the LEED Certification of the project as specified in Section 01 81 13.***

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

_____

_____

_____

A/E's REVIEW AND ACTION

- ☐ Substitution approved – Make submittals in accordance with Specification Section 01 33 00.
- ☐ Substitution approved as noted – Make submittals in accordance with Specification Section 01 33 00.
- ☐ Substitution rejected – Use specified materials.
- ☐ Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

_____

_____

_____

_____

_____

SECTION 01 02 50

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section defines the Lump Sum Prices, Unit Prices (Not Used), 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.

B. 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.

C. 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.

1.2 BID PROPOSAL

A. **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.

B. **Allowance Items:** Allowance Item amounts are provided by the OWNER 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 1.3, below.

C. **Retention:** Payment for all bid items is subject to the retention provisions of the General Conditions.

D. **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 OWNER 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.

E. **Stipulated or Bid Unit Prices:** When the OWNER'S use of a Unit Price Bid Item exceeds 200% of the Bid Item quantity, the CONTRACTOR or OWNER may demand that the Unit Price Item be renegotiated for quantities in excess of the 200%, whether the price is stipulated or bid. This provision is to prevail over any conflicting general condition provision.

F. Quantities for each item in the Bid Schedule will be used to analyze the bids and determine contract award.

G. **Specified Items and Stipulated Prices**: The stipulated price for these items cannot be invoiced until the item is complete and accepted by the RESIDENT ENGINEER.

1.3 MEASUREMENT AND PAYMENT

A. **General:** This article defines the manner and method to develop the Lump Sum, Unit Price, 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. Unit Price and 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.

B. **Contract-Required WORK**

1. **Bid Item No. 1 - Construction of Permanent Fire Station No. 17 and related site improvements. (Lump Sum):**

   Description: The lump sum payment for the Construction of Permanent Fire Station No. 17 located at 4206 Chamoune Ave and related ("on" and "off") site improvements shall be considered full compensation for furnishing, demolition, constructing and completion of all facilities, including but not limited to Photo Voltaic roof system, mobilization, demobilization, insurance, supervision, planning, design, and engineering fees, complete as defined within these Contract Documents.

2. **Bid Item No. 2 - Construction of Temporary Fire Station No. 17 and related site improvements. (Lump Sum):**

   Description: The lump sum payment for the Construction of Temporary Fire Station No. 17 located at 4000 University Ave and related ("on" and "off") site improvements shall be considered full compensation for furnishing, demolition, constructing and completion of all facilities, mobilization, demobilization, insurance, supervision, planning, design, and engineering fees, complete as defined within these Contract Documents.

3. Bid Item No. 3 –Building Permits (Allowance):

Refer to City Supplement section 7-5, “Permit, Fees, and Notices.”

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/Resident Engineer.

Allowance amount: = $100,000.00

4. Bid Item No. 4 – SDG&E Service Fee, Dry Utilities Connections (Allowance):

Description: Payment for the SDG&E Service Fee, dry utilities connections, Pacific Bell, A.T.& T. and Time Warner/Cox 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/Resident Engineer.

Allowance amount: = $70,000.00

5. Bid Item No. 5 – Furniture, Fixtures and Equipment (Allowance):

Description: 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.

Allowance amount: = $120,000.00

6. Bid Item No. 6 – Bonds (Lump Sum):

Description: Refer to the GREENBOOK and City Supplement section 2-4.1 “Contract Bonds.” 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.

7. **Bid Item No. 7 Water Pollution Control Program Implementation (Lump Sum)**

   Description: Permanent Station #17 Refer to City Supplement section 701-13.9.5.

8. **Bid Item No. 8 Water Pollution Control Program Development (Lump Sum)**

   Description: temporary Station #17 Refer to City Supplement section 701-13.9.5.

9. **Bid Item No. 9 – Field Orders (Allowance):**

   Description: Refer to City Supplement section 9-3.5. 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/Resident Engineer.
   Determining the price for miscellaneous field orders will be done in accordance with the Contract Document provisions.
   Allowance amount: = $350,000.00

PART 2 - PRODUCTS

2.1 GENERAL PROGRESS PAYMENT REQUIREMENTS

A. Payment for WORK performed shall be in accordance with the Cost Loaded CPM. The City Representative/RESIDENT ENGINEER 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.

B. 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/RESIDENT ENGINEER.

C. Unit price items will be paid based on quantities (or equivalent quantities) installed.

D. 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/ RESIDENT ENGINEER prior to the CONTRACTOR obtaining approval for the Summary of Earned Values or quantities installed and the Application for Payment.

E. The CONTRACTOR shall not take advantage of any apparent error or omission on the Drawings or Specifications, and the City Representative/RESIDENT ENGINEER 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 OWNER.

F. The retainage specified in the contract shall apply to all payments to the CONTRACTOR including permits and mobilization.

2.2 APPLICATION FOR PAYMENT

A. Application for payment shall be on the City's form provided by the City Representative /RESIDENT ENGINEER 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.

B. 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.

C. 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/RESIDENT ENGINEER.

PART 3 - EXECUTION

3.1 MONTHLY REVIEWS/APPLICATION FOR PAYMENT

A. Monthly review meetings between the CONTRACTOR and the City Representative/ RESIDENT ENGINEER will be held within 7 days prior to the payment application date designated by the City Representative/RESIDENT ENGINEER. 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/RESIDENT ENGINEER 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/RESIDENT ENGINEER will sign the payment request and forward it to the City. The City Representative/RESIDENT ENGINEER will determine payment amounts if agreement with the CONTRACTOR is not reached.

3.2 PAYMENT FOR PRODUCTS STORED ON SITE

A Refer to City Supplement section 9-3.3.1.1.

B. 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 $5,000.00 (five thousand) 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.

3.3 PARTIAL PAYMENTS FOR MATERIALS STORED OFF SITE

A. Refer to City Supplement section 9-3.3.1.2.

B. 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.

C. 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.

D. 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.

E. 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.

F. 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.

G. 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.

END OF SECTION 01 02 50

5-6-15R

SECTION 01 11 00

SUMMARY OF WORK

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. The summary of the scope of work includes demolition of the existing Fire station located at 4206 Chamoune Ave., San Diego, CA, 92115 and the construction of a (10,760 SF) new Permanent station at the same site location. The scope also, includes assembling temporary station components (located at 4000 41st Street, San Diego 92115), which consist of a (sprung structure and state approved trailer/coach with related site improvements) to accommodate the fire crew until the construction of the new Permanent station is completed. Once the new Permanent station is completed the fire fighters can move into the new facility. In addition to the scope of work, the temporary sprung structure and the trailer/coach to be moved to a storage within 30 miles radius from the no longer needed temporary station site location (The physical storage address will be provided by Fire department at a later time during the construction stage). Also, the majority of the related site improvements of the temporary site are to be demolished and removed, as noted in the plans. The entire scope of work is based on the entire contract documents such as but not limited to Contracts, addenda, drawings, specifications, reports, utility design documents, etc.

B. Base Bid: The bid shall include labor, material, equipment, services and transportation necessary for the demolition and construction of the Project as identified in the Contract Docuemnts.

C. Sustainable/"Green" Requirements: The building(s) on the site and the sitework adjacent to the building(s) are designed and shall be constructed as sustainable entities. The requirements for sustainable/"green" construction are contained throughout the Contract Documents and in particular are specified in the following specification sections:
1. Section 01 35 43 - Environmental Procedures.
2. Section 01 81 13 – Sustainable Design Requirements.

D. The requirements of Tech Specs Part 1 – Special Provisions of City Volume 1 – General shall apply to all specification sections in Divisions 02 through 48 as if fully repeated therein and shall govern if there is a conflict.

E. Extra Work: Performed at the same labor rates and component rates as the original work as specified and indicated on Drawings.

F. Costs for Work which is not specified or indicated on Drawings: Subcontractors shall provide costs based upon work specified or indicated on Drawings. In addition, Subcontractors shall provide a listing (with prices) for work that in their opinion will need to be accomplished to provide a complete and operational building project. No additional cost(s) will be paid by the Owner that is not identified at the time of bidding.

G. Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. In particular, requirements of Division 1 which impact a particular trade (e.g. Section 01 35 46 - Indoor Air Quality Management requirements to be performed by the mechanical subcontractor) shall be included in the Work of the applicable subcontractor. The Contract Documents shall be provided to in their entirety to each subcontractor who shall review and identify all of the work that they will perform to the General Contractor. Nothing in this paragraph shall remove the responsibility of the Contractor to supervise, inspect and direct the work in accordance with the General Conditions

1.02 DEFINITIONS PERTAINING TO THE CONTRACT DOCUMENTS

A. Furnish: To purchase and deliver.

B. Install: To place into final position and connect.

C. Provide: To furnish and install.

D. "As shown", "as detailed", "as indicated" or words of similar import mean as indicated on the drawings

E. "As selected", "as approved" or words of similar import mean as selected by, as approved by, or as accepted by the Resident Engineer.

F. "Approved equal", "or equal" shall mean as approved and accepted by the Resident Engineer.

G. "Shall" means mandatory.

H. "As required" means as required by the contract documents.

I. "As necessary" means essential to the completion of the work.

J. "Concealed" means not visible in the finished work.

K. "Exposed" means visible in the finished work.

L. "Days" means working days.

M. Substantial Completion: That stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

1.03 WORK BY OWNER

A. Items noted 'NIC' (Not in Contract) will be furnished and installed by Owner.

1.04 OWNER FURNISHED ITEMS

A. Products furnished to the site and paid for by Owner shall be as noted on Drawings.

B. Owner's Responsibilities:
1. Arrange for and deliver Owner reviewed Shop Drawings, Product Data, and Samples, to Contractor.
2. Arrange and pay for product delivery to site.

3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for Manufacturers' warranties, inspections and service.

C. Contractor's Responsibilities:
1. Contractor shall give Owner written notice stating dates when Owner-furnished items must be received at the job site to insure Project completion in accordance with established schedule.
2. Review Owner-reviewed Shop Drawings, Product data, and Samples
3. Receive and unload products at site; inspect for completeness or damage, jointly with Owner.
4. Handle, store, assemble, install, connect and finish such products, including furnishing lubricants and fluids and procedures required to render product serviceable and operative.
5. Contractor is responsible for the coordination and interface of Owner-Furnished and Installed work with Work of this Contract to provide all required mechanical and electrical rough-ins, openings, supports, dimensions, etc., as required for a complete installation

1.05 CONTRACTOR USE OF SITE

A. General: Contractor shall have full use of the site within Contract Limit Lines indicated for construction operations during the construction period.

1.06 PERMITS, FEES AND NOTICES

A. Plan check fees have been paid by the Owner.

B. The Contractor shall secure and pay for the building permit and for other permits and governmental fees, licenses and special inspections, (see also Volume 2 – Bid List Item #3)

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

D. It is not the responsibility of the Contractor to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the Resident Engineer in writing, and any necessary changes shall be accomplished by appropriate Modification.

E. If the Contractor performs Work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Resident Engineer, the Contractor shall assume full responsibility therefor and shall bear attributable costs.

1.07 SPECIAL SITE AND PROJECT CONDITIONS

A. Contractor shall ensure that exposed piping, valves, connections, drains and apparatus of any kind shall be fully reviewed and coordinated with the Resident Engineer.
   1. Exposed sprinkler heads shall typically be placed in the center of the ceiling tile or pattern.
   2. The shop drawings shall explicitly cloud all exposed conditions and shall be reviewed, authorized and initialed by the Resident Engineer prior to installation.
      a. The purpose of this review is to ensure that all components of this system are placed in as discrete and as minimally impacting a location as possible.
      b. Failure by the fire sprinkler system designer/subcontractor to point out and secure Resident Engineer review and written approval of all exposed conditions shall result in relocation of any exposed items as directed by the Resident Engineer at no additional cost to the owner.
   3. Contractor shall ensure that hangers, supports, pipes, braces to be hung true and vertical (neat and clean) where exposed to view.

B. Additional time required by Architect & Architect's consultants due to negligence of General Contractor and/or Subcontractor shall be paid for by General Contractor (through deduction from progress payments by the Resident Engineer) per their hourly rates.

1.08 APPROVED APPLICATORS

A. Where specific instructions in the Specifications require that a particular product and/or material be applied and/or installed by an "approved applicator" it shall be the Contractor's responsibility to insure that any Subcontractor or Subsubcontractor used for such Work is in fact currently certified by the particular Manufacturer for this type of installation or application.

1.09 APPROVED MANUFACTURERS

A. Each Section includes a list of Manufacturers whose equipment is acceptable as to manufacture, subject to conformance with the Contract Documents. Careful checking must be made by the Contractor and the manufacturer or equipment supplier to verify that the equipment will meet all capacities, requirements, space allocations and is suitable to the intended purpose.

1.10 REFERENCE DATA

A. The Contractor shall establish and maintain all buildings and construction grades, lines, levels, and bench marks. (See also Volume – Special Provisions)

1.11 ARCHITECTURAL BARRIERS

A. It is the desire of the Owner that the facilities and improvements constructed under this Contract meet or exceed the intent of applicable public law concerning prohibition of discrimination, and that no individual be discriminated against on the basis of disability in the full and equal enjoyment of the goods, services, facilities, privileges, advantages, or accommodations of this completed Project. The designers and drafters of these Documents have intended to incorporate those Owner's intentions into these Documents.

B. It is recognized that there may be products not incorporated into these Documents that may more nearly meet the Owner's desires than those included.

C. The Owner hereby solicits those providing elements of this Project to bid and contract for the Project as required by these Documents, but at the time of submitting Shop Drawings, or sooner when appropriate, and without causing delay in the Project, to also submit proposals for improving the accessibility of the Project to physically or mentally impaired persons.

1.12 WEATHER TIGHT - WATER PROOF

A. The Contractor shall be responsible for providing weather tight - water proofed building regardless if there are no drawings/details describing particular areas of the buildings.

END OF SECTION

SECTION 01 26 13

CONTRACTOR'S REQUESTS FOR INFORMATION / INTERPRETATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Administrative requirements for requests for information / interpretation.

1.02 DEFINITIONS

A. Request For Information / Interpretation (RFI):
1. A document submitted by the Contractor requesting clarification of a portion of the Contract Documents, hereinafter referred to as RFI.
2. A properly prepared request for information / interpretation shall include a detailed written statement that indicates the specific Drawings or Specification in need of clarification and the nature of the clarification requested.
   a. Drawings shall be identified by drawing number and location on the drawing sheet.
   b. Specifications shall be identified by Section number, page and paragraph.
3. Requests for Information: Request made by Contractor concerning items not indicated on drawings or contained in Technical Specifications that is required to properly perform the work.

B. Improper RFI's:
1. RFI's that are not properly prepared.
2. Improper RFI's will be processed by the Resident Engineer with the Architect at the Architect's standard hourly rate and Architect will charge the Owner, and such costs will be deducted from monies still due the Contractor. The Contractor will be notified by the Resident Engineer prior to the processing of improper RFI's.

C. Frivolous RFI's:
1. RFI's that request information that is clearly shown on the Contract Documents.
2. Frivolous RFI's may be returned unanswered or may be processed by the Resident Engineer with the Architect at the Architect's standard hourly rate and Architect will charge the Owner, and such costs may be deducted from monies still due the Contractor. The Contractor will be notified by the Architect and Resident Engineer prior to the processing of frivolous RFI's.

1.03 CONTRACTOR'S REQUESTS FOR INFORMATION

A. RFI's shall be submitted on Document included in the Technical Specifications.
1. Forms shall be completely filled in, and if prepared by hand, shall be fully legible after photocopying or transmission by facsimile (fax).
2. RFI's shall be submitted in numerical order with no breaks in the consecutive numbering.
3. Each page of attachments to RFI's shall bear the RFI number and shall be consecutively numbered in chronological order.
4. RFI's may be submitted by E-Mail.
   a. Submittal by E-Mail is the preferred method of submittal.
   b. Address for E-Mail will be distributed by the Resident Engineer at the Pre-Construction Conference.

B. When the Contractor is unable to determine from the Contract Documents, the material, process or system to be installed, the Resident Engineer shall be requested to make a clarification of the indeterminate item.
   1. Wherever possible, such clarification shall be requested at the next appropriate project meeting, with the response entered into the meeting minutes. When clarification at the meeting is not possible, either because of the urgency of the need, or the complexity of the item, Contractor shall prepare and submit an RFI to the Resident Engineer.

C. RFI's shall be originated by the Contractor.
   1. RFI's from subcontractors or material suppliers shall be submitted through, reviewed by, and signed by the Contractor prior to submittal to the Resident Engineer.
   2. RFI's from subcontractors or material suppliers sent directly to the Resident Engineer shall not be accepted and will be returned unanswered..

D. Contractor shall carefully study the Contract Documents to assure that the requested information is not available therein. RFI's which request information available in the Contract Documents will be deemed either "improper" or "frivolous" and returned.

E. RFI's shall not be used for the following purposes:
   1. To request approval of submittals
   2. To request approval of substitutions,
   3. To request changes which are known to entail additional cost or credit. (A Change Order Request form shall be used.)
   4. To request different methods of performing work than those drawn and specified.

F. In the event the Contractor believes that a clarification by the Resident Engineer results in additional cost or time, Contractor shall not proceed with the work indicated by the RFI until a Change Order (or Construction Change Directive, if applicable to project) is prepared and approved. RFI's shall not automatically justify a cost increase in the work or a change in the project schedule.
   1. Answered RFI's shall not be construed as approval to perform extra work.
   2. Unanswered RFI's will be returned with a stamp or notation: Not Reviewed.

G. Contractor shall prepare and maintain a log of RFI'S, and at any time requested by the Resident Engineer, Contractor shall furnish copies of the log showing outstanding RFI'S. Contractor shall note unanswered RFI's in the log.

H. Contractor shall allow up to 20 working days review and response time for RFI'S.
   1. The Resident Engineer and Architect will endeavor to respond in a timely fashion to RFI's.
   2. RFI shall state requested date/time for response, however, this requested date/time for response is not a guarantee that the RFI will be answered by that date/time if that date/time is too expeditious

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

Not applicable.

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 GENERAL

1.01 GENERAL

A. See Whitebook 7-6.1.

1.02 PRECONSTRUCTION MEETING

A. A Preconstruction Meeting to discuss the Project work will be held at a time and location designated by the Resident Engineer.

B. Contractor, and representatives of major Subcontractors, shall meet with Owner and Architect. The purpose of this conference is to discuss the Project in detail, including scheduling of Work, and to answer questions. Unless followed up in writing, verbal authorizations or acknowledgement of those present are not binding.

C. Meeting minutes will be taken by the Resident Engineer.

D. LEED™ requirements as specified in Section 01 81 13 shall be reviewed during this conference.

1.03 PROGRESS MEETINGS

A. At time designated by Resident Engineer, bi-weekly Progress Meeting will be held at Project site.

B. Contractor and representatives of major Subcontractors shall meet with Resident Engineer.

C. Contractor is responsible for notifying Subcontractors of their required attendance. These meetings will address progress of the Work and problems that may have developed since the previous meeting.

D. LEED™ requirements as specified in Section 01 81 13 shall be reviewed with the various subcontractors as applicable to the stage of the work and during each progress meeting.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 GENERAL

A. See Green Book and Whitebook.

1.02 CONSTRUCTION SCHEDULE

A. Submit 6 copies of the Construction Schedule at Preconstruction Meeting, broken down by Trade or Material, to the Resident Engineer for approval prior to the first Progress Payment Request. Schedule shall be by Critical Path Method (CPM) or bar graph type, and shall show proposed starting and completion dates for each Trade and activity for the Work. Submit 6 copies of updated schedule at each Progress Payment Request field review to the Resident Engineer.

B. Submit completed construction schedule to Resident Engineer no later than 35 calendar days after Notice to Proceed and update monthly during construction. Submit current schedule with each application for payment.

C. Submit completed material delivery schedule to the Resident Engineer no later than 35 calendar days after the date of the Notice to Proceed. Identify material critical to the progress of the Project and those for which long lead time in procurement is anticipated. Indicate projected dates for submittal, order and delivery of such material.

1.03 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Shop Drawings: (See also Volume 1 – Special Provisions and Green Book.).
   1. Following Contractor's review and approval, submit shop drawings to the Resident Engineer for review.
      a. Electronic (PDF format only) submittal transmitted via e-mail is preferred.
      b. Shop drawings submitted electronically will be reviewed and returned electronically.
   2. Full sized scaled (24 inch by 36 inch) drawings on paper (minimum 6 sets) shall be provided for the following to allow for Architect's redline:
      a. Door details and elevations.
      b. Window details and elevations.
      c. Steel framing.
      d. Reinforcing in foundations.
      e. Millwork/casework details and elevations.
      f. Solid Composite Exterior Wall Panels details and elevations
   3. The Resident Engineer will review the Drawings and affix a stamp indicating the findings of the review, and will return same to the Contractor.
   4. Comments, if any, will be noted directly on the electronic copy or on a copy of the full sized scaled drawings on paper.
   5. The Contractor shall distribute the appropriate number of copies to the various Trades and to Contractor's job personnel as required.
   6. Fire Alarm System/Fire Sprinklers System Shop Drawings shall be submitted to Resident Engineer prior to submittal to the state and local Fire Marshal for approval. Obtain approval prior to installation. Fire Marshal inspection, test and approval of completed installations shall be obtained prior to acceptance of the systems and Substantial Completion of the Project.

7. Provide shop drawings for all exterior cladding, rain screen construction and associated flashing indicating materials and methods to be used to ensure building is protected from water migration and condensation.

B. Product Data: Following Contractor's review and approval, submit to the Resident Engineer copies of Manufacturer's catalogs and brochures as required by the Specifications. Resubmit corrected copies for approval in accordance with original submittal.

C. Samples:
1. Following Contractor's review and approval, submit to the Resident Engineer samples of materials in quantities and sizes as required by the Specifications.
2. Submittals required other than for selection of color, texture, fabric or finish shall be given to the Resident Engineer at a time determined by the Contractor, which will allow for resubmittal and which will not cause and delay in the Work.
3. Corrected samples shall be resubmitted for approval as per the original submittal.

D. Color Selection: Within 30 days of the date of Agreement, submit to the Architect for approval, samples and appropriate information required for the selection of colors, textures, fabric and finishes for the entire Project. Final selection of color, textures, fabrics or finishes will not be made until all applicable and related submittals have been provided. If the Contractor fails to provide the required samples and related information within the time period, the Architect shall have the option of selecting colors, textures, fabric, finishes or specific materials from those specified or approved and the Contractor shall be obligated to provide the material selected by the Architect.

E. Submit Shop Drawings and Samples for only those items specifically mentioned in the Specifications. Contractor shall be responsible for obtaining Shop Drawings required for the progress of the Work, even though such Shop Drawings may not require the Resident Engineer's review.

F. Partial Submittals: Submittals which are partial or contain only a portion of the data required to describe the item or installation will be rejected, unless such partial submittal is coordinated with the Resident Engineer prior to submittal, and final approval of all such items will be withheld pending receipt of all required information.

G. Deviations: All deviations from the Contract Documents shall be clearly identified in the submittal. Submittal shall include only items included in the specifications or which have been approved in advance by the Resident Engineer in accordance with requirements of Section 01 60 00. Submittals containing items which have not been approved in advance by the Resident Engineer will be rejected.

H. Environmentally Sensitive Materials (Green Products):
1. Specifications are based upon the use of environmentally sensitive materials.
2. In some cases, manufacturer's standard products may contain materials that do not comply with specified requirements for the usage of environmentally sensitive materials and compliance with the specified requirements may not be possible.
3. Contractor shall submit product data electronically for products that are proposed for use that do not comply with specified requirements for the usage of environmentally sensitive materials.
4. Owner reserve the right to disapprove the submittal (and subsequent usage) for products that are proposed for use that do not comply with specified requirements for the usage of environmentally sensitive materials.

1.04 QUALITY CONTROL SUBMITTALS

A. Equipment Lists: Following Contractor's review and approval, submit to the Resident Engineer 6 complete lists of major items of mechanical, plumbing and electrical equipment and materials, within 30 calendar days after date of Agreement. Submit all items at one time. Partial list will not be acceptable. Submittals shall include the Manufacturer's Specifications, weights, space requirements, physical dimensions, rating of equipment and supplemental information requested by the Resident Engineer. Submit performance curves for pumps and fans. Where a submittal sheet describes items in addition to that item being submitted, delete such items. Clearly note equipment and materials which deviate from those shown or specified in size, weight, required clearances, and location of access. Modifications to the Work as shown or specified in submittals shall be indicated and shall be provided by the Contractor as a part of the Work.

B. Manufacturer's Instructions: Where Specifications require Work to be furnished, installed or performed in accordance with a specified product Manufacturer's instructions, distribute copies of such instructions to concerned parties.

C. Manufacturers' standard dimension drawings and performance and product data shall be edited to delete reference to equipment, features, or information that is not applicable to the equipment being supplied for this project.

D. Provide sufficient copies of approved data, with the engineers approved stamp for inclusion in the operation and maintenance manuals as specified in Section 01 91 00 - Commissioning.

E. Flame Spread Ratings: For each finish material, provide manufacturer's brochures and approved testing agency report for finishes to verify compliance with flame spread ratings set forth in IBC 404 and IBC Chapter 8.

1.05 LEED SUBMITTALS

A. Prior to start of construction: The following shall be submitted a minimum of 15 calendar days prior to the start of construction for review and acceptance.
   1. Construction IAQ Management Plan as specified in Section 01 35 46 - Indoor Air Quality Management.
   2. Sedimentation and Erosion Control (ESC) Plan as specified in Section 01 57 13 – Temporary Erosion and Sediment Control shall be submitted for approval prior to commencement of demolition or construction activities on the project site.

B. Prior to installation of products: The following shall be submitted a minimum of 7 calendar days prior to the installation of the applicable product.
   1. Product Form:
      a. Prior to installation of a product into the work, submit a completed form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification.
      b. Product data sheets and other supporting documentation shall be included.
      c. Submit product form, product data sheets, other supporting documentation and low emitting materials forms in electronic form as PDF documents.
      d. Information contained on the Product Form shall be used to complete the information required for the LEED Submission.

C. During the course of construction:
   1. Summary of Project Waste Generated in accordance with Section 01 74 19.
   2. Items required by Owner or Architect as identified in the Environmental Protection Plan in accordance with Section 01 35 43.
   3. Other pertinent items required by the Owner or Architect and identified during the Pre-Construction Conference or subsequent Project Meetings.

D. Prior to Substantial Completion:
   1. Provide the submittals related to construction IAQ management as specified in Section 01 35 46 - Indoor Air Quality Management.:

END OF SECTION

SECTION 01 35 43

ENVIRONMENTAL PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Procedures for achieving the most environmentally conscious Work feasible within the limits of the Construction Schedule, Contract Sum, and available materials, equipment, and products.
   1. Participate in promoting efforts of Owner and Architect to create an energy-efficient and environmentally sensitive structure.
   2. Use recycled-content, toxic-free, and environmentally sensitive materials, equipment, and products.
   3. Use environmentally sensitive procedures.
      a. Protect the environment, both on-site and off-site, during demolition and construction operations.
      b. Prevent environmental pollution and damage.
      c. Effect optimum control of construction waste.

B. Related Sections:
   1. Section 01 31 19 - Project Meetings: Preconstruction conference.
   2. Section 01 33 00 – Submittal Procedures: Submittals for "non-green" products.
   3. Section 01 35 46 – Indoor Air Quality Management
   4. Section 01 60 00 – Product Requirements Product substitution procedures.
   5. Section 01 74 19 - Construction Waste Management: Waste collection, and disposal operations.
   6. Section 01 77 00 – Closeout Procedures: Cleaning and final submittals.
   7. Section 01 81 13 – Sustainable Design Requirements: Procedures required of the Contractor to ensure that construction procedures and documentation required for US Green Building Council LEED Certification are provided.
   8. Section 02 41 00 - Demolition: Salvage and waste disposal operations.

C. See also CAL-GREEN requirements on Drawings Sheet A0.3.

1.02 SUBSTITUTIONS

A. Notify Owner when Contractor is aware of materials, equipment, or products that meet the aesthetic and programmatic intent of Contract Documents but are more environmentally sensitive than materials, equipment, or products specified or indicated in the Contract Documents.

B. Substitution requirements of Section 01 60 00, apply except as follows:
   1. Prior to submitting detailed information required under Section 01 60 00, submit the following for initial review by Resident Engineer:
      a. Product data including manufacturers name, address, and phone number.
      b. Description of the differences of the proposed substitution from specified product. Include description of environmental advantages of proposed substitution over specified product.
      c. MSDS Sheets (for information only, not for verification of conformance under OSHA requirements.)
   2. Submit additional information as directed by Resident Engineer.

1.03 PRECONSTRUCTION MEETING

A. At the preconstruction meeting specified in Section 01 31 19 – Project Meetings, discuss the proposed Construction Waste Management and Environmental Protection Plan and develop a mutual understanding relative to details of environmental protection, recycling, and rebate programs.

1.04 SUBMITTALS

A. Construction Waste Management Plan: In accordance with Section 01 74 19-- Construction Waste Management.

B. Environmental Protection Plan:
1. List of federal, state, and local laws, regulations, and permits concerning environmental protection, environmental pollution and damage, hazardous materials, construction and demolition waste, chemical waste, sanitary waste, sediment, water, air, and noise pollution that are applicable to the Contractor's proposed operations.
2. List species of fish and wildlife (as applicable to this project) that require specific attention, along with measures for their protection.
3. Procedures to be implemented to provide the required environmental protection and to comply with the applicable laws and regulations. Document existing conditions.
4. Procedures for Recycling/Reuse Program, including:
   a. Name, location, and phone number.
   b. Copy of permit or license for each facility.

C. Environmental Cleaning Plan: Submit cleaning / housekeeping policies and environmental cleaning solution product data sheets.
1. Provide written program for training and implementation.
2. Provide written plan for integrating the Green Housekeeping program into the overall project Environmental Protection Plan
3. Material Safety Data Sheets (MSDS) on chemicals approved for use within the building.
4. Develop list of approved and prohibited chemicals and practices.

1.05 QUALITY ASSURANCE

A. Regulatory requirements:
1. Cleaning materials and methods shall meet federal mandates including Executive Order 13101 on Greening the Government through Waste Prevention, Recycling and Federal Acquisition and Section 23.703 of the Federal Acquisition Regulation which requires federal agencies to consider environmental factors when purchasing products and services.
2. Comply with the criteria of Green Seal standard GS-37 (see www.greenseal.org) OR California Code of Regulations, Title 17 Section 94509, VOC standards for cleaning products (go to www.calregs.com, click on "California Code of Regulations" and perform a keyword search for "94509").

PART 2 PRODUCTS

2.01 MATERIALS

A. Furnish environmentally responsible materials as defined above and as specified in the various specification sections of these Technical Specifications.

B. Cleaning Materials:
1. Utilize non-hazardous chemicals that have no or greatly reduced impacts upon the environment.
2. Provide Green Seal approved ENVIRCARE chemical line, which consists of products that are non-hazardous and have a low environmental impact.
3. Utilize concentrated cleaning products when available.

PART 3 EXECUTION

3.01 ENVIRONMENTAL GOALS IMPLEMENTATION

A. Contractor shall designate an on-site party (or parties) responsible for overseeing the Environmental Goals for the project and instructing workers and subcontractors in the means and methods of achieving those goals.

B. Distribution: The Contractor shall distribute copies of the Environmental Goals to the Job Site Foreman, each Subcontractor, and the Resident Engineer.

C. Meetings: Contractor shall discuss the implementation of the Environmental Goals at the following meetings:
1. Partnering meeting.
2 Pre-construction meeting.
3. Progress meetings.

3.02 RECYCLING AND REUSE

A. See Section 01 74 19 - Construction Waste Management.

3.03 ENVIRONMENTAL CONTROLS

A. Protection of natural resources: Preserve the natural resources within the project boundaries and outside the limits of permanent work performed under this Contract in their existing condition or restore to an equivalent or improved condition as approved by Owner, upon completion of the Work.
1. Confine demolition and construction activities to work area limits indicated on the Drawings.
a. Temporary construction: As specified in Section 01 50 00.
b. Salvage operations: As specified in Section 02 41 00.
c. Disposal operations for demolished and waste materials that are not identified to be salvaged, recycled, or reused:
1) Remove debris, rubbish, and other waste materials resulting from demolition and construction operations from site.
2) No burning permitted.
3) Transport materials with appropriate vehicles, and dispose off-site to areas that are approved for disposal by governing authorities having jurisdiction.
4) Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways. Remove spillage. and sweep, wash, or otherwise clean project site, streets, or highways.
5) Comply with applicable regulations.

2. Land resources: Prior to construction, identify land resources to be preserved within the Work area. Do not remove, cut, deface, injure, or destroy land resources, including trees, shrubs, vines, grasses, topsoil, and land forms without permission from Owner.
   a. Earthwork: As specified in Section 31200 – Earthwork for Structures and Pavements and as follows:
      1) Erodible soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils, except where the constructed feature obscures borrow areas, quarries, and waste material areas. Clear areas in reasonably sized increments only as needed to use the areas developed. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
      2) Erosion and sedimentation control devices: Construct or install temporary and permanent erosion and sedimentation control features as required.. Provide 'biofence" (www.biofence.com), hay bales or other methods as required to provide silt control into adjacent washes, creeks, rivers, lakes and other wetlands as directed by Resident Engineer and/or Civil Engineer. See Section 01 57 13 – Temporary Erosion and Sediment Control for additional requirements.
   b. Tree and plant protection: Prior to start of construction, tag each tree and plant scheduled to remain with value as identified by Owner. In the event of damage to tree or plant, Owner may, at Owner's discretion, deduct the indicated value of the damaged tree or plant from the Contract Sum.
3. Air Resources: Prevent creation of dust, air pollution, and odors.
   a. Use water sprinkling, temporary enclosures, and other appropriate methods to limit to lowest practical level dust and dirt rising and scattering in air.
      1) Dust mitigation shall be as required by local Environmental Health Department.
      2) Do not use water when it may create hazardous or other adverse conditions such as flooding and pollution.
   b. Store volatile liquids, including fuels and solvents, in closed containers.
   c. Properly maintain equipment to reduce gaseous pollutant emissions.
   d. Interior final finishes: Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible, in accordance with approved Construction Waste Management and Environmental Protection Plan.
   e. Temporary Ventilation: As specified in Section 01 50 00—Temporary Facilities and Controls, and as follows:
      1) Provide adequate ventilation during and after installation of interior wet products and interior final finishes.
      2) Provide adequate ventilation of packaged dry products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of 60 degrees F minimum to 90 degree F maximum continuously during the ventilation period. Do not ventilate within limits of Work unless otherwise approved by Resident Engineer.
      3) Preoccupancy ventilation: After final completion and prior to initial occupancy, provide adequate ventilation for minimum five days. Preoccupancy ventilation procedures:
         a) Use supply air fans and ducts only.
         b) Temporarily seal exhaust ducts.

c) Temporarily disable exhaust fans.
d) Provide exhaust through operable windows or temporary openings.
e) Provide temporary exhaust fans as required to pull exhaust air from deep interior locations. Stair towers may be used for exhausting air from the building during the temporary ventilation.
f) After preoccupancy ventilation and prior to final testing and balancing of HVAC system, replace air filters and make HVAC system fully operational.

3.04 INDOOR AIR QUALITY

A. See Section 01 81 13 – Sustainable Design Requirements for requirements relating to Indoor Environmental Quality (EQ) Prerequisite No. 1 - Minimum IAQ Performance.

B. Verify ventilation requirements for indoor air quality. "Adequate" requirements for one material may not be "adequate" for another; for example, carpet can contain over 100 chemicals, including possible carcinogens, and may required more complex ventilation to accelerate offgassing prior to installation. Materials/products that generally require temporary ventilation for off gassing include:
1. adhesives
2. wood preservatives
3. composite wood products
4. plastics
5. waterproofing
6. insulation
7. fireproofing
8. sealants/caulking
9. acoustical ceilings
10. resilient flooring
11. carpet
12. painting
13. sealers/coatings
14. wall coverings
15. manufactured casework
16. furniture

END OF SECTION

SECTION 01 35 46

INDOOR AIR QUALITY MANAGEMENT

PART 1 GENERAL

1.01 CONSTRUCTION IAQ MANAGEMENT PLAN (LEED EQ Credit No. 3.1)

A. Not applicable to this Project.

1.02 CONSTRUCTION IAQ MANAGEMENT PLAN (LEED EQ Credit No. 3.2)

A. Contractor shall develop an Indoor Air Quality (IAQ) Management Plan and implement it after all finishes have been installed and the building has been completely cleaned before occupancy. The IAQ Management Plan shall include either a building flush out (option 1) or air quality testing (option 2).

B. Flush-out (Option 1): In conjunction with the Architect and the Mechanical Engineer, develop and implement an Indoor Air Quality (IAQ) Management Plan for pre-occupancy phase **per one of the following**:

1. After construction ends, prior to occupancy and with all interior finishes installed, install new MERV 13 filters in air handling units and perform a building flush-out by supplying a total air volume of 14,000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60%. After the flush out, inspect filters and replace if needed with MERV 13 and return the HVAC system to its normal operational mode.
2. If occupancy is desired prior to completion of the flush-out (and upon completion of construction with all interior finishes installed and new MERV 13 filters in air handling units), the space may be occupied following delivery of a minimum of 3,500 cu. ft. of outdoor air per square foot of floor area to the space. Once a space is occupied, it shall be ventilated as a minimum rate of 0.30 cfm / sq.ft. of outside air or the design minimum outside air rate determined by EQ Prerequisite 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of 3 hours prior to occupancy and continue during occupancy. There conditions shall be maintained until a total of 14,000 cu. ft./sq. ft. of outside air has been delivered to the space. After the flush out, inspect filters and replace if needed with MERV 13 and return the HVAC system to its normal operational mode.

C. Air Quality Testing (Option 2):

1. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design and Construction Reference Guide."
2. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:
   a. Formaldehyde: 27 ppb.
   b. Particulates (PM10): 50 micrograms/cu. m.
   c. Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
   d. 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
   e. Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

3. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.
4. Air-sample testing shall be conducted as follows:
   a. All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
   b. Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
   c. Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
   d. Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

END OF SECTION

SECTION 01 42 00

REFERENCES

1.01 QUALITY ASSURANCE

A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents.

C. Obtain copies of standards when required by Contract Documents.

D. Should specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

E. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.02 SCHEDULE OF REFERENCES

AA	Aluminum Association 900 19th St. N.W., Suite 300 Washington, DC 20006 www.aluminum.org	(202) 862-5100
AABC	Associated Air Balance Council 1518 K. Street, N.W. Washington, DC 20005 www.aabchq.com	(202) 737-0202
AACPA	Autoclaved Aerated Concrete Product Association 3701 C.R. 544 E Haines City, FL 33844 www.aacpa.org	(863) 419-2058
AAMA	American Architectural Manufacturers Association 1540 E. Dundee Rd., Suite 310 Palatine, IL 6067-8321 www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, N.W., Suite 249 Washington, DC 20001 www.aashto.org	(202) 624-5800
ACI	American Concrete Institute P. O Box 9094 Farmington Hills, MI 48999-9094 www.aci-net.org	(248) 848-3700
ADC	Air Diffusion Council 230 North Michigan Avenue Chicago, IL 60601 www.flexibleduct.org	(312) 201-0101

AFPA	American Forest and Paper Association (Formerly: National Forest Products Association 1111 19th St., NW, Suite 800 Washington, DC 20036 www.afandpa.org	(202) 463-2700
AI	Asphalt Institute 2696 Research Park Dr P.O. Box 14052 Lexington, KY 40512-4052 www.asphaltinstitute.org	(606) 288-4960
AIA	American Institute of Architects 1735 New York Avenue, N.W. Washington, DC 20006-5292 www.aia.org	(202) 626-7300
AISC	American Institute of Steel Construction 1 E. Wacker Dr., Suite 3100 Chicago, IL 60601 www.aisc.org	(312) 670-2400
AISI	American Iron and Steel Institute 1101 17th Street, N.W., Suite 1300 Washington, DC 20036 www.steel.org	(202) 452-7133
AITC	American Institute of Timber Construction 7012 S. Revere Pky, Suite 140 Englewood, CO 80112 www.aitc-glulam.org	(303) 792-9559
AMCA	Air Movement and Control Association 30 West University Drive Arlington Heights, IL 60004 www.amca.org	(847) 394-0150
ANSI	American National Standards Institute 11 West 42nd Street, 13th Fl New York, NY 10036 www.ansi.org	(212) 642-4900
APA	Engineered Wood Association (Formerly: American Plywood Association) P.O. Box 11700 Tacoma, WA 98411 www.apawood.org	(253) 656-6600
API	American Petroleum Institute 1220 L Street, N.W. Washington, DC 20005 www.api.org	(202) 682-8000
AQMD	Air Quality Management Dirstrict 21865 E. Copley Drive Diamond Bar, CA 91765 www.aqmd.gov	(909) 396-2000
ARI	Air-Conditioning and Refrigeration Institute 4301 N. Fairfax Dr., Suite 425 Arlington, VA 22203 www.ari.org	(703) 524-8800

ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta, GA 30329 www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017 www.asme.org	(800) 843-2763 (973) 882-1167
ASTM	American Society for Testing and Materials 100 Barr Harbor Dr West Conshohocken, PA 19428 www.astm.org	(610) 832-9585
AWI	Architectural Woodwork Institute 1952 Isaac Newton Square West Reston, VA 20190 www.awinet.org	(703) 733-0600
AWPA	American Wood Preservers Association PO Box 5690 Granbury, TX 76049 www.awpa.com	(817) 326-6300
AWS	American Welding Society 550 NW LeJeune Road Miami, FL 33126 www.amweld.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 www.awwa.org	(303) 794-7711
BHMA	Builders Hardware Manufacturer's Association 355 Lexington Ave., 17th Floor New York, NY 10017	(212) 661-4261
BIA	Brick Institute of America 11490 Commerce Park Drive Reston, VA 22091 www.bia.org	(703) 620-0010
CDA	Copper Development Association 260 Madison Ave. New York, NY 10016 www.copper.org	(212) 251-7200
CFPC	Certified Forest Products Council 14780 SW Osprey Drive, Suite 285 Beaverton, OR 97007 www.certifiedwood.org	(503) 590-6600
CISCA	Ceilings and Interior Systems Construction Association 1500 Lincoln Highway, Suite 202 St. Charles, IL 60174 www.cisca.org	(630) 584-1919
CLFMI	Chain Link Fence Manufacturers Institute 9891 Broken Land Pkwy, Ste 300 Columbia, MD 21046 www.chainlinkinfo.org	(301) 596-2584

CRI	The Carpet and Rug Institute Box 2048 Dalton, GA 30722-2048 www.carpet-rug.com	(706) 278-3176
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Road Schaumburg, IL 60173 www.crsi.org	(847) 517-1200
CSSB	Cedar Shingle and Shake Bureau (Formerly: Red Cedar Shingle and Handsplit Shake Bureau) 515 116th Avenue Bellevue, WA 98004	(425) 453-1323
CTI	Ceramic Tile Institute of America 2061 Jefferson Blvd Culver City, CA 90230 http://www.ctioa.org/	(310) 574-7800
DCAT	Development Center for Appropriate Technology P.O. Box 41144 Tucson, AZ 85717 www.dcat.net	(520) 624-6628
DHI	Door and Hardware Institute 14170 Newbrook Drive Chantilly, VA 20151 www.dhi.org	(703) 222-2010
DOE	U.S. Department of Energy 1000 Independence Ave., SW Washington, DC 20585 http://www.energy.gov	(800) 342-5363
EEBA	Energy and Environmental Building Association 10740 Lyndale Avenue South, 10W, Bloomington, MN 55420-5615 http://www.eeba.org/	(952) 881-1098
EBN	Environmental Building News 122 Birge St., Suite 30 Brattelboro, VT 05301 www.BuildingGreen.com	(802) 257-7300
EJMA	Expansion Joint Manufacturers Association 25 North Broadway Tarrytown, NY 10591 www.ejma.org	(914) 332-0040
EPA	U.S. Environmental Protection Agency 401 M St. WS, 6202J Washington, DC 20460 www.epa.gov	(202) 775-6650
FSC	Forest Stewardship Council - U.S. 1155 30th Street NW Suite 300 Washington, DC 2007 www.fscus.org	(877) 372-5646

FM	FM Global (Formerly: Factory Mutual Sytem) 1151 Boston-Providence Turnpike P.O. Box 688 Norwood, MA 02062 www.factorymutual.com	(781) 762-4300
GA	Gypsum Association 125 S Franklin St Chicago, IL 60606 www.usg.com	(312) 606-4000
GANA	Glass Association of North America (Formerly: Flat Glass Marketing Association) 3310 SW Harrison St Topeka, KS 66611 www.glasswebsite.com/gana	(785) 266-7013
GBCI	Green Building Certification Institute 2101 L Street NW, suite 650 Washington, DC 20037 www.gbci.org	(800) 795-1746
ICC	International Code Council *Headquarters* 5203 Leesburg Pike, Suite 600 Falls Church, VA 22041 *Los Angeles District Office* 5360 S. Workman Mill Road Whittier, CA 90601 http://www.iccsafe.org/	 703-931-4533 800-284-4406
IEEE	Institute of Electrical and Electronics Engineers 3 Park Ave 17th Floor New York, NY 10016 www.ieee.org	(212) 419-7900
ISRI	Institute of Scrap Recycling Industries 1325 G St. NW, Suite 1000 Washington, DC 20005-3104 www.isri.org	(202) 737-1770
MBMA	Metal Building Manufacturer's Association 1300 Sumner Ave. Cleveland, OH 44115	(216) 241-7333
MIL	Military Specification Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120	
ML/SFA	Metal Lath/Steel Framing Association (A Division fo the NAAMM) 8 South Michigan Ave., Suite 1000 Chicago, IL 60603	(312) 456-5590
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Ave, Suite 1000 Chicago, IL 60603 www.naamm.org	(312) 456-5590

NCMA	National Concrete Masonry Association 2302 Horse Pen Rd. Herndon, VA 22071 www.ncma.org	(703) 713-1900
NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877 www.nebb.org	(301) 977-3698
NEMA	National Electrical Manufacturers Association 1300 N 17th St, Ste 1847 Rosslyn, VA 22209 www.nema.org	(703) 841-3200
NFPA	National Fire Protection Association 1 Battery March Park Quincy, MA 02269 www.nfpa.org	(800) 344-3555 (617) 770-3000
NRCA	National Roofing Contractors Association 10255 W. Higgins Rd., Suite 600 Rosemont, IL 60018 www.roofonline.org	(847) 299-9070
NTMA	National Terrazzo and Mosaic Association 110 E Market St, Ste 200A Leesburg, VA 20176 www.ntma.com	(800) 323-9736 (703) 779-1022
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077 www.portcement.org	(847) 966-6200
PCI	Precast/Prestressed Concrete Institute 209 W. Jackson Blvd Chicago, IL 60606 www.pci.org	(312) 786-0300
PDCA	Painting and Decorating Contractors of America 3913 Old Lee Hwy., Suite 33B Fairfax, VA 22030 www.pdca.com	(703) 359-0826
PS	Product Standard U. S. Department of Commerce Washington, DC 20203	
RIS	Redwood Inspection Service 405 Enfrente Rd Novato, CA 94949	(415) 382-0662
RCSHSB	Red Cedar Shingle and Handsplit Shake Bureau	Refer to CSSB
RFCI	Resilient Floor Covering Institute 966 Hungerford Dr., Suite 12B Rockville, MD 20850 www.buildernet.com/rfci	(301) 340-8580
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60021-0025 www.sdi.org	(847) 462-1930

SDI	Steel Door Institute 30200 Detroit Rd. Cleveland, OH 44145 www.steeldoor.org	(440) 899-0010
SIGMA	Sealed Insulating Glass Manufacturers Association 401 N. Michigan Ave Chicago, IL 60611 www.sigmaonline.org	(312) 664-6610
SJI	Steel Joist Institute 3127 10th Ave Extension North Myrtle Beach, SC 29582 www.steeljoist.org	(843) 626-1995
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Drive Chantilly, VA 20151 www.smacna.org	(703) 803-2980
SSPC	The Society for Protective Coatings (Formerly: Steel Structures Painting Council) 4516 Henry St., 6th Flr Pittsburgh, PA 15222 www.sspc.org	(412) 281-2331
TCA	Tile Council of America, Inc. 100 Clemson Research Blvd Anderson, SC 29625 www.tileusa.com	(864) 646-8453
UL	Underwriters' Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062 www.ul.com	(800) 704-4050
USGBC	US Green Building Council 1825 I St. NW, Suite 400 Washington, DC 20006 www.usgbc.org	(202) 429-2081
WCLIB	West Coast Lumber Inspection Bureau Box 23145 Portland, OR 97281 www.wclib.org	(503) 639-0651
WDMA	Window and Door Manufacturing Association (Formerly: National Woodwork Manufacturers Association 1400 E. Touhy Avenue, Ste 470 Des Plaines, IL 60018 www.wdma.com	(800) 223-2301
WWPA	Western Wood Products Association 522 S.W. 5th Ave., Ste 500 Portland, OR 97204 www.wwpa.org	(503) 224-3930

END OF SECTION

SECTION 01 42 15

TERMINOLOGY

PART 1 GENERAL

1.01 DESCRIPTION

A. Work included: Terminology used on drawings and within specifications and the meanings intended. The following list is limited to those words which experience indicates are most often misused and sources of confusion. Words, which are consistently properly used and understood, are not included.

1.02 DEFINITIONS PERTAINING TO THE CONTRACT DOCUMENTS

A. In accordance with Section 01 11 00 - Summary of Work.

1.03 TERMS ("GREEN" BUILDING AND LEED™ RELATED)

A. ADEQUATE VENTILATION: Ventilation, including air circulation and air changes. Required to cure materials, dissipate humidity, and prevent accumulation of dust fumes, vapors, or gases. [See Section 01 81 13 - for requirements relating to Indoor Environmental Quality (EQ) Prerequisite No. 1 - Minimum IAQ Performance.] (Section 01 35 43)

B. AIR BARRIER SYSTEM: The assembly of components used in building construction to create a plane of air tightness throughout the building envelope and to control air leakage. (Icynene)

C. ADAPTIVE REUSE: Renovation of a building or site to include elements that allow a particular use or uses to occupy a space that originally was intended for a different use. (Antron)

D. ALTERNATIVE ENERGY: Energy from a source other than the conventional fossil-fuel sources of oil, natural gas and coal (i.e., wind, running water, the sun). Also referred to as "alternative fuel." (Antron)

E. BAKE-OUT: Process by which a building is heated in an attempt to accelerate VOC emissions from furniture and materials. (Antron)

F. BIODEGRADABLE: Waste material composed primarily of constituent parts that occur naturally, are able to be decomposed by bacteria or fungi, and are absorbed into the ecosystem. Wood, for example, is biodegradable, while plastics are not. (Antron)

G. BUILDING ENVELOPE: The external elements walls, floor, ceiling, roof, windows and doors of a building that encloses conditioned space; the building shell. (Icynene)

H. BUILDING FOOTPRINT: The area on a project site that is used by the building structure and is defined by perimeter of the building plan. Parking lots, landscape and other non-building facilities are not included in the building footprint. (LEED SS Credit 5)

I. BROWNFIELDS: Abandoned, idled or underused industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination. (Antron)

J. CHAIN OF CUSTODY: A tracking procedure to document the status of a product from the point of harvest or extraction to the ultimate consumer end use. *(from LEED™ Reference Guide Version 2.0, June 2001, pg 188)*

K. CHEMICAL WASTE: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes. (Section 01 35 43)

L. CLOSED-LOOP RECYCLING: When a used product is recycled into a similar product; a recycling system in which a particular mass of material (possibly after upgrading) is remanufactured into the same product (e.g., glass bottles into glass bottles). (Antron)

M. COMPOST: Process whereby organic wastes, including food wastes, paper and yard wastes, decompose naturally, resulting in a product rich in minerals and ideal for gardening and farming as a soil conditioner, mulch, resurfacing material or landfill cover. (Antron)

N. CONSTRUCTION [AND DEMOLITION] WASTE: Includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair. [and demolition]operations.
1. Rubbish: Includes both combustible and noncombustible wastes, such as paper. boxes, glass. crockery, metal and lumber scrap, metal cans. and bones.
2. Debris: Includes both combustible and noncombustible wastes, such as leaves and tree trimmings that result from construction or maintenance and repair work. (Section 01 35 43)

O. CRADLE-TO-CRADLE: A term used in life-cycle analysis to describe a material or product that is recycled into a new product at the end of its defined life. (Antron)

P. CRADLE-TO-GRAVE: A term used in life-cycle analysis to describe the entire life of a material or product up to the point of disposal. Also refers to a system that handles a product from creation through disposal. (Antron)

Q. DAYLIGHTING: Daylighting optimizes the use of natural light through design considerations to illuminate the interior of buildings during the day. Common daylighting strategies include the proper orientation and placement of windows, use of light wells, light shafts or tubes, skylights, clerestory windows, light shelves, reflective surfaces, and shading, and use of interior glazing to allow light into adjacent spaces. (Dcat)

R. DEVELOPMENT FOOTPRINT: The area on the project site that has been impacted by any development activity. Hardscape, access roads, parking lots, non-building facilities and building structure are all included in the development footprint.

S. ENVIRONMENTAL FOOTPRINT: For an industrial setting, this is a company's environmental impact determined by the amount of depletable raw materials and nonrenewable resources it consumes to make its products, and the quantity of wastes and emissions that are generated in the process. Traditionally, for a company to grow, the footprint had to get larger. Today, finding ways to reduce the environmental footprint is a priority for leading companies. (Antron)

T. ENVIRONMENTALLY RESPONSIBLE MATERIALS:
1. Products made from environmentally attractive materials such as "salvaged products" and "products with post-consumer recycled content."
2. Products that are green because of what isn't there, such as alternative to products made from PVC and polycarbonate.
3. Products that reduce environmental impacts during construction, renovation, or demolition.
4. Products that reduce environmental impacts of the building operation, such as equipment that conserves energy and products that prevent pollution or reduce waste.
5. Products that contribute to a safe, healthy indoor environment such as products that remove indoor pollutants. (Section 01 35 43)

U. ENVIRONMENTAL TOBACCO SMOKE: Secondhand tobacco smoke exposure. (Antron)

V. FLY ASH
1. A fine, glass-powder recovered from the gases of burning coal during the production of electricity. These micron- sized earth elements consist primarily of silica, alumina and iron. When mixed with lime and water the fly ash forms a cementitious compound with properties very similar to that of Portland cement. Because of this similarity, fly ash can be used to replace a portion of cement in the concrete, providing some distinct quality advantages. The concrete is denser resulting in a tighter, smoother surface with less bleeding. Fly Ash concrete offers a distinct architectural benefit with improved textural consistency and sharper detail.
2. Fly ash with a low LOI (carbon content) is used as a substitute for Portland cement in concrete. Regulations vary from state to state, however, ASTM suggests that fly ash must not contain more than 6% unburned carbon to be used for its cementitious qualities. Otherwise, concrete companies use it as a fine aggregate in concrete block. Others use it for filling old coal mines, seaside docking areas and as a lining for hazardous waste dumps. (Antron)

W. GREEN BUILDING: Green Building refers to the process of designing and constructing buildings in ways that minimize their negative ecological impacts. This includes concern for the full life cycle impacts of buildings from the acquisition of resources and materials, transportation, processing, manufacture, distribution, installation, use, maintenance, repair, and ultimate disposal. Green building usually also includes efforts to ensure energy efficiency, material and resource efficiency and healthy and safe indoor environment in terms of the toxicity of materials and indoor air quality. (Dcat)

X. GREEN DEVELOPMENT: Green development is a development approach that benefits or has minimal negative impacts to the local and larger environment, uses resources efficiently (including community resources), and is sensitive to the existing local culture and community. (Dcat)

Y. GREEN MATERIALS, PRODUCTS, AND SYSTEMS: Green materials. Products, and systems have many of the following characteristics: are durable, are low-maintenance, have low-embodied energy (energy required to acquire, transport, manufacture and install), are locally available, are made from recycled or renewable resources and can be recycled or renewed, have low toxicity, produce little pollution or waste, and have minimal negative ecological impacts. (Dcat)

Z. GREENFIELD: Undeveloped land or land that has not been impacted by human activity.

AA. GREENWASH: Disinformation disseminated by an organization so as to present an environmentally responsible public image. (Antron)

AB. INDOOR AIR QUALITY (IAQ): ASHRAE defines acceptable indoor air quality as air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which 80% or more people exposed do not express dissatisfaction. (Antron)

AC. INTEGRATED WASTE MANAGEMENT: The complementary use of a variety of practices to handle solid waste safely and effectively. Techniques include source reduction, recycling, composting, combustion and landfilling. (Antron)

AD. LIFE CYCLE OF A PRODUCT: All stages of a product's development, from extraction of fuel for power to production, marketing, use and disposal. (Antron)

AE. LIFE CYCLE ANALYSIS (LCA): The assessment of a product's full environmental costs, from raw material to final disposal, in terms of consumption of resources, energy and waste. (Antron)

AF. MATERIAL SAFETY DATA SHEET (MSDS): A standard formatted information sheet, prepared by a material manufacturer, describing the potential hazards, physical properties, and procedures for safe use of a material. (Icynene)

AG. OPEN-LOOP RECYCLING: A recycling system in which a product made from one type of material is recycled into a different type of product (e.g., used newspapers into toilet paper). The product receiving recycled material itself may or may not be recycled. (Antron)

AH. PASSIVE SOLAR DESIGN: Passive solar design of buildings maximizes the use of the sun for heating during cool weather and minimizes solar gain from the sun in warm weather. Design features typically include south-facing orientation of windows for winter sun (in the northern hemisphere), general east-west orientation of the building, roof and overhangs that provide shade from the summer sun but allow the winter sun through the windows, and thermal mass in the interior to store heat or coolness and maintain more constant temperatures within the structure. Good insulation is typical also for most of the building envelope, to control heat loss and gain. (Dcat)

AI. POST-CONSUMER MATERIAL: Any household or commercial product that has served its original, intended use. (Antron)

AJ. POST-CONSUMER RECYCLE CONTENT: A product composition that contains some percentage of material that has been reclaimed from the same or another end use at the end of its former, useful life. (Antron)

AK. POST-INDUSTRIAL MATERIAL: Industrial manufacturing scrap or waste; also called pre-consumer material. (Antron)

AL. POST-INDUSTRIAL RECYCLE CONTENT: A product composition that contains some percentage of manufacturing waste material that has been reclaimed from a process generating the same or a similar product. Also called pre-consumer recycle content. (Antron)

AM. RECLAMATION: Restoration of materials found in the waste stream to a beneficial use that may be other than the original use. (Antron)

AN. RECYCLE: A strategy to process material in order to extend the usable life of that material. (Section 01 35 43)

AO. REDUCE: A strategy to use less of a material or to use it more efficiently. (Section 01 35 43)

AP. RENEWABLE RESOURCES: A resource that can be replenished at a rate equal to or greater than its rate of depletion; i.e., solar, wind, geothermal and biomass resources. (Antron)

AQ. RESOURCE CONSERVATION: Practices that protect, preserve or renew natural resources in a manner that will ensure their highest economic or social benefits. (Antron)

AR. RETROFIT: The modification of an existing building or facility to include new systems or components. (Icynene)

AS. REUSE:
1. A strategy to return a material to achieve use in the same or a related capacity. ((Section 01 35 43)
2. Using a product or component of municipal solid waste in its original form more than once. (Antron)

AT. SALVAGED MATERIALS: Construction materials recovered from existing building and reprocessed for reuse in other buildings. Common salvaged materials include structural beams and posts, flooring, doors, cabinetry, brick and decorative items. *(from LEED™ Reference Guide Version 2.0, June 2001, pg 188)*

AU. Sediment: Soil and other debris that has been eroded and transported by storm or well production runoff water. (Section 01 35 43)

AV. SOLAR THERMAL WATER HEATING: Here the energy of the sun is used to provide or supplement a building's hot water supply. This can be both domestic hot water and for building heat, usually through radiant heat systems. (Dcat)

AW. SOURCE REDUCTION.
1. The design, manufacture, purchase or use of materials to reduce the amount or toxicity of waste in an effort to reduce pollution and conserve resources (i.e., reusing items, minimizing the use of products containing hazardous compounds, extending the useful life of a product and reducing unneeded packaging).
2. Practices that reduce the amount of any hazardous substance, pollutant or contaminant entering any waste stream or otherwise being released into the environment. Such practices also reduce the risk to public health and the environment associated with such releases. Term includes equipment or technology modifications, substitution of raw materials, and improvements in housekeeping, maintenance, training or inventory control. (Antron)

AX. TIPPING FEE:
1. Charge for the unloading or dumping of waste at a recycling facility, composting facility, landfill, transfer station or waste-to-energy facility. (Antron)
2. Fees charged by the landfill for dumping large cvolumes of disposable waste. The fee is usually quoted for one ton of waste. (Section 01 35 43)

AU. TOTAL VOLATILE ORGANIC COMPOUNDS: The total mass, typically in milligrams per cubic meter, of the organic compounds collected in air. (Antron)

AZ. VAPOR RETARDER: A layer of moisture resistant material usually which controls moisture diffusion (defined as less than 1 perm) to prevent moisture build up in the walls. (Icynene)

BA. VOLATILE ORGANIC COMPOUNDS (VOC): Any compound containing carbon and hydrogen or containing carbon and hydrogen in combination with other elements. (Icynene)

BB. WASTE TO ENERGY: Burning of industrial waste to provide steam, heat or electricity. Sometimes referred to as waste-to-fuel process. (Antron)

1.04 TERMS (ELECTICITY, HVAC AND VENTILATION RELATED)

A. AIR CHANGES PER HOUR (ACH)**:** An expression of ventilation rates - the number of times in an hour that a home's entire air volume is exchanged with outside air. (Icynene)

B. BATTERY POWER STORAGE SYSTEMS: Battery systems that are designed to store power in batteries that has been generated by solar photovoltaic, wind, micro-hydroelectric, or other site-based power generation systems. (Dcat)

C. BLOWER DOOR: Diagnostic equipment consisting of a fan, removable panel and gauges, used to measure and locate air leaks. (Icynene)

D. COMBUSTION EFFICIENCY: A measure of useful heat extracted from a fuel source by an operating heating appliance. For example a furnace with a combustion efficiency of 60 percent converts 60 percent of the fuels energy content into useful heat. The rest is lost as exhaust gases. (Icynene)

E. CONDUCTION TRANSMISSION: of energy (heat /sound) through a material or from one material to another by direct contact. Materials with low rates of conductive heat transfer make good insulation. (Icynene)

F. CONVECTION TRANSMISSION: of energy (heat /sound) from one place to another by movement of a fluid such as air or water. (Icynene)

G. DEW POINT: The temperature at which a vapor begins to condense. (Icynene)

H. EXFILTRATION: Uncontrolled leakage of conditioned air from inside the home to the outside. (Icynene)

I. HEAT RECOVERY VENTILATION SYSTEM: A mechanical ventilation system that recovers energy from exhausted indoor air and transfers it to incoming air. This system usually incorporates an air-to-air heat exchanger which transfers the heat from exhaust air to the incoming air or vice versa. (Icynene)

J. HUMIDISTAT: A humidity sensitive control device that signals the ventilation system to operate if the humidity goes above a preset limit. (Icynene)

K. MICRO-HYDROELECTRIC SYSTEMS: Micro hydroelectric systems generate electricity by harnessing the flow of a stream or some other small scale flowing water source. Surplus electricity is often stored in a battery storage system for later use. (Dcat)

L. PASSIVE VENTILATION: Passive ventilation relies typically on using both convective air flows that result from the tendency of warm air to rise and cool air to sink and taking advantage of prevailing winds. Many passive ventilation systems rely on the building users to control window and vents as dictated by site conditions and conditions within the building. (Dcat)

M. RELATIVE HUMIDITY: The ratio expressed as a percentage of the amount of moisture air actually contains to the maximum amount it could contain at that temperature. (Icynene)

N. SOLAR PHOTOVOLTAIC SYSTEMS: These systems harness the energy of the sun and convert it into electricity. This electricity can be used as either direct current (DC) power or alternating current (AC) power if an inverter is used. Surplus electricity is often stored in a battery storage system for later use. (Dcat)

O. SOLAR THERMAL AIR HEATING: This uses the energy of the sun to heat air either for direct space heating or to heat the thermal mass of the building or heat storage systems (such as water tanks, rock pits). (Dcat)

P. THERMAL BRIDGE: A thermally conductive material which penetrates or bypasses an insulation system; such as a metal fastener or stud. (Icynene)

Q. THERMAL RESISTANCE: (R) An index of a material's resistance to heat flow. (Icynene)

R. WIND POWER SYSTEMS: These convert the energy of the wind into electricity. Surplus electricity is often stored in a battery storage system for later use. (Dcat)

1.05 TERMS (WATER RELATED)

A. GREYWATER SYSTEMS: Greywater systems take water used once for washing clothes or bodies and distribute that water for secondary use, typically for substrate irrigation of landscaping. (Dcat)

B. WATER HARVESTING SYSTEMS: These systems collect rainwater for use after a rain event. Features in the system include catchment/storage systems such as gutters and cisterns, landscaping features (swales, basins, etc.) to direct the rainwater to plants and/or hold the water to slow the infiltration rate. (Dcat)

1.06 TERMS (UNITS RELATED)

A. BTU: British Thermal Unit - The amount of energy that is required to raise 1 lb. of water up 1° F (Icynene)

B. BTUH: A rate of energy transfer - can be expressed as Btu's/hour. (Icynene)

C. KILOWATT-HOUR (kWh): Standard unit for measuring electrical energy consumption-kilowatts X hours. (Icynene)

D. PERM: A unit of water vapor transmission defined as 1 grain of water vapor per square foot per hour per inch of mercury pressure difference (1 inch mercury = 0.49 psi). Metric unit of measure is ng/m^2 s Pa. 1 perm = 55 ng/m^2 s Pa. (Icynene)

E. PH: A measure of acidity/alkalinity of aqueous mixtures. A measure of pH 7 is neutral, lower is more acidic, higher is more alkaline. (Icynene)

F. PSI: Pounds per square inch. (Icynene)

G R A: unit of measurement of resistance to heat flow in hr. ft^2 ° F/BTU.in. (Icynene)

H. RSI: A unit of measurement of resistance to heat flow in m^2 ° C/W per 25 mm. R = 0.176 RSI. (Icynene)

I. U-VALUE: Overall thermal conductance. U value is equal to the inverse of the sum of the R-values in a system (U = 1 /R total). (Icynene)

1.07 TERMS (GENERAL)

A. ACCESS DOOR: Small doors not included in door schedules which are typically a prefabricated assembly including frame and door.

B. ACCESS PANEL A section of finish which can be opened.

C. ACOUSTICAL SEALANT: Non-hardening caulking or sponge tape used to seal partitions to structural ceiling, walls and floor to reduce sound transmissions.

D. ANCHOR BOLT: A bolt that is embedded in masonry or cast-in-place in concrete.

E. AS-BUILT DRAWING: A drawing or print marked by the Contractor to show actual conditions as constructed. For Architect's drawing, see RECORD DRAWING.

F. BACKING: A continuous material behind entire area of finish, as opposed to intermittent or edge support.

G. BATT INSULATION: Roll type insulation for installation between studs or joists, either pressed fit or stapled. See also BLANKET INSULATION.

H. BLANKET INSULATION: Roll type insulation for installation over suspended ceiling or on plane wall surfaces. Either laid loose or secured with stick clips. See also BATT INSULATION.

I. BUILDING PAPER: Sheathing paper or felt.

J. CAULK, CAULKING: Non-elastomeric fillers and joints subject to little movement, generally indoors.

K. CASING BEAD: Plaster stop.

L. CEMENT PLASTER: Portland cement plasters used at interior spaces.

M. COLD JOINT: Use to describe a joint where the material on one side of the joint is to be set or hard before the other side is installed and no particular bonding is expected.

N. CONTROL JOINT: A joint to limit cracking, or a joint which is necessary to the construction process but continuity or bonding is required.

O. DAMPPROOFING: A coating intended to resist vapor transmission and dampness, but not designed to resist a head of water.

P. DELETE: Something to be taken out by intention. See also OMIT.

Q. DOWNSPOUT: A rain water conduit made of sheet metal or plastic. See also LEADER.

R. ELASTOMERIC: A material which is inherently rubbery, typically used to describe sealant, flashing, membrane, etc.

S. EXPANSION BOLT: Single unit bolt with integral anchoring device, such as Wej-it or Kwik Bolt.

T. EXPANSION JOINT: A joint designed for structural movement, both expansive and contractive.

U. EXPANSION SHIELD: Use for devices that receive a separate screw or bolt and also note type of screw or bolt.

V. FURRED CEILING: Any ceiling not directly attached to the floor or roof framing above except suspended acoustical ceiling.

W. FURRING: Any ceiling not directly attached to the floor or roof framing above except suspended acoustical ceiling.

X. FURRING CHANNEL: Cold rolled steel channel. For hat-shaped 25 gauge steel channels see METAL FURRING.

Y. GLAZED OPENING: Used at interior partitions.

Z. GROOVE: A long, narrow indentation. In wood, use only when parallel to the grain. See also RABBET.

AA. GROUT: Any cementitious material used to fill, level or set other materials.

AB. GYPSUM BOARD: Wall and ceiling finish material. Abbreviation is GYP.BD.

AC. HANDRAIL: Single rail. For protective barricade type rails see RAILING.

AD. HANGER: Any suspended structural member by which other members are attached.

AE. HARDWOOD: No specific species. Wood from broadleaved evergreen or deciduous trees. See also WOOD for softwood.

AF. HEAVYGAUGE FRAMING: Weldable load bearing metal studs and joists.

AG. HOISTWAY: Use for elevators and dumbwaiters.

AH. HOISTWAY BEAM: Beams supporting guiderails between multiple hoistways.

AI. JOINT BACKER: Material behind sealant which establishes depth of sealant. Generally shown on drawings but not noted.

AJ. JOINT FILLER: Material which fills entire joint. May also be used with sealant.

AK. LEADER: A rain water conduit made of pipe or tubing. See also DOWNSPOUT.

AL. LIGHTGAUGE FRAMING: 20 and 25 gauge non-loadbearing interior framing assemblies. For weldable loadbearing assemblies see HEAVYGAUGE FRAMING.

AM. LIGHTWEIGHT AGGREGATE CONCRETE: Concrete of lightweight aggregates not designed to provide insulation.

AN. METAL FRAME: Pressed metal frames used with doors and panel or glazed openings.

AO. METAL FURRING: Hat-shaped, 25 gauge steel channels used to furr out walls and for furring ceilings. For cold rolled steel channels see FURRING CHANNEL.

AP. OMIT: To leave out by intention. See also DELETE.

AQ. PANELING: Sheet or board material for interior use.

AR. PANELS: Sheet material, with some sort of joint or trim for exterior or interior use.

AS. PARTITION: Non-loadbearing vertical panel subdividing interior spaces, either rated or non-rated. For loadbearing see WALL.

AT. PATCH: Replacement or repair of material or finish to match existing conditions.

AU. PLASTER: Specifications shall define type, i.e., gypsum plaster, Keenes Cement, etc.

AV. PROVIDE: Denotes "Furnish and Install."

AW. RABBET: Groove at edge of member only.

AX. RAILING: Multiple railed barrier. See also HANDRAILS.

AY. RECORD DRAWING: Drawings revised to include construction changes. See "AS-BUILT DRAWING" for drawings prepared by the Contractor.

AZ. REFINISH: To put a finish back into its original condition.

BA. RELOCATE: To move from one location and install in another location.

BB. REPLACE: To provide a substitute or equivalent for.

BC. RUNNER CHANNEL: 1-1/2 inch cold rolled steel channel.

BD. SCREED: Metal or wood strip placed at intervals to gauge thickness of applied materials.

BE. SCRIBE STRIP: Strip to make tight closure to adjoining surfaces.

BF. SEALANT: Elastomeric materials at joints subject to movement or weather penetration at outdoors or indoors. If purpose is acoustical use ACOUSTICAL SEALER.

BG. SEAMLESS FLOORING: Sheet material with joints field welded or sealed, or field installed materials finished to provide a homogenous flooring material.

BH. SECTION:
1. Drawing showing cut through an object.
2. Subdivision of a Division of the specifications as defined by the CSI MasterFormat.

BI. SELF-EDGE: Application to edge of plywood or particleboard of plastic laminate of same pattern as face surface.

BJ. SERVICE SINK: Wall or floor mounted sink.

BK. SHEET: Thin construction material.

BL. SHEET FLOORING: Resilient flooring installed in lengths, generally wall to wall with joints depending upon manufactured widths of roll material.

BM. SHEET METAL: General term on drawings with specifications defining particulars.

BN. SOUND DEADENING BOARD: High density wallboard, wood fiber or gypsum, not suitable for painting or finishing.

BO. STAGGER: To offset building elements in a horizontal or vertical plane as stagger studs, stagger joints.

BP. STOCK: Raw material, i.e. 2x4 stock.

BQ. STUD: Upright framing member of wood or metal.

BR. SUBFLOORING: Usually of different grade and thickness than used for wall or roof sheathing.

BS. THRU: Short version of THROUGH on drawings only.

BT. TOE BOARD: Raised protective edge at balconies, landings, etc. (OSHA requirement).

BU. TOE SPACE: Recess at base of cabinets.

BV. TYPICAL: Representative example, characteristic of a kind.

BW. UNDERLAYMENT: A smooth, hard sheet material, placed over rougher substrates to achieve a surface suitable for the application of such finishes as resilient tile.

BX. WAINSCOT: Finish on the lower part of a partition when it differs from that of the upper wall.

BY. WALL: Vertical panel enclosing a building or that serves as an occupancy separation. Generally loadbearing.

BZ. WATERPROOFING: Designed to resist a head of water.

CA. WOOD: Used to describe solid stock softwoods. See also HARDWOOD.

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 GENERAL

1.01 TESTING LABORATORY SERVICES

A. General Contractor shall coordinate with an independent testing laboratory, acceptable to the Resident Engineer, to perform their Work called for in the Contract Documents.

B. Contractor shall furnish samples for such tests to the testing agency as directed by the Testing Agency. Owner shall pay for testing agency initial testing.

C. Special Inspectors: Provide evidence of qualifications prior to beginning of inspecitions.

D. The testing laboratory shall distribute copies of reports as follows:
1. 1 copy to Owner
2. 2 copies to the Architect
3. 1 copy to the Structural Engineer
4. 2 copies to the Contractor
5. 1 copy to Governing Building Department (if applicable)

E. Non-conformance items are to be identified by Testing Agency separately from daily observation reports within 48 hours.

F. Costs for retesting required due to Contractor's failure to comply with specified requirements shall be paid for by the Contractor. Cost from "stand by" time by testing agency due to inadequate coordination by contractors shall be paid for by General Contractor.

G. The following list is intended as a guide to the Contractor to aid in the determining testing requirements for the project, however, the requirements specified in the technical sections shall take precedence over this list and this list is not to be interpreted as being complete.
1. 03 30 00 - Cast-In-Place Concrete: Test cylinders, slump test(s), floor flatness, calcium chloride moisture testing.
2. 04 05 15 - Mortar and Masonry Grout: Test of mortar and grout mix, all masonry.
3. 04 22 00 – Concrete Masonry Units: Prism testing.
4. 05 10 00 - Structural Metal Framing: Welded connection tests, inspection of high strength bolts.
5. 05 31 00 – Steel Deck: Deck testing/inspection when required.
6. 05 41 00 - Load-Bearing Metal Stud System: Steel framing properties, when required.
7. 07 92 00 - Joint Sealers: Field adhesion testing and stain testing.
8. 31200 – Earthwork for Structures and Pavements: Test imported fill materials if required, observation of earthwork by Geotechnical Engineer, density and moisture testing of trench backfill, field density tests of underslab fill and backfill.
9. Other testing as noted elsewhere in specifications.

H. Contactor shall request testing with 72 hour prior written notice unless more stringent longer notification period is desired on drawings.

1.03 CONTRACTOR'S QUALITY CONTROL

A. Where Specifications require that a particular product be installed and/or applied by an Applicator approved by the Manufacturer, it is the Contractor's responsibility to ensure that Subcontractor employed for such Work is approved. Such Subcontractor(s) shall provide evidence of being approved when requested by the Architect.

B. Work shall be executed by mechanics skilled in the Work required. Conform to the methods, standards and accepted practices of the Trade or Trades involved.

1.04 SPECIAL INSPECTIONS

A. Costs for Special Inspection fees will be paid directly by the Owner.

B. Costs for scheduled or called for inspections of items that are not ready for inspection (under any and all circumstances) shall be back-charged to the Contractor.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 GENERAL

A. Comply with codes and regulations regarding potable drinking water, sanitation, dust control, fire protection, and other temporary controls.

B. Remove temporary office facilities, toilets, storage sheds and other construction of temporary nature from the site as soon as, in the opinion of the Resident Engineer, the progress of the work will permit. Recondition and restore to a condition acceptable to the Resident Engineer, areas of the site occupied by temporary facilities.

C. Obtain written approval from the Resident Engineer a minimum of 72 hours prior to disconnection or shutting off service or utility.

1.02 TEMPORARY ELECTRICITY

A. Connect to existing power service. Power consumption shall not disrupt Owner's need for continuous service.

B. Provide temporary electric feeder from location as directed.

C. Provide power outlets for construction operations, with branch wiring and distribution boxes. Provide flexible power cords as required.

D. Provide main service disconnect and overcurrent protection at convenient location.

E. Permanent convenience receptacles may be utilized during construction.

F. Provide adequate distribution equipment, wiring, and outlets to provide branch circuits for power and lighting.

1.03 TEMPORARY LIGHTING

A. Provide incandescent lighting for construction operations to achieve a minimum lighting level of 2 watts/sq. ft.

B. Provide adequate floodlights, clusters and spot illumination to work areas after dark.

C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

D. Maintain lighting and provide routine repairs.

1.04 TEMPORARY HEATING AND VENTILATING

A. Provide temporary heating and ventilating as required to maintain specified conditions for construction operations and pay cost of energy used. Exercise measures to conserve energy.

B. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place.
   1. If air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be used at each return air grills, as determined by ASHRAE 52.2. Verify with Mechanical Engineer prior to implementation.
   2. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

C. Maintain minimum ambient temperature of 50 degrees F. in areas where construction is in progress, unless indicated otherwise in specifications.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Also see requirements for "Construction IAQ Management Plan" as specified in Section 01 35 46 – Indoor Air Quality Management.

1.05 TELEPHONE AND INTERNET SERVICE

A. At time of project mobilization, provide telephone for field office. A pay phone is not acceptable. Maintain and pay for telephone service, including costs for long distance service and calls.

B. Computer and Internet Access: Provide computer with secure internet access in field office.
   1. Provide DSL or Cable wireless modem access with 1.5 Mbps minimum.
   2. Computer and wireless modem shall be made available to Contractors, Resident Engineer, Architect, Engineer, Owner and Site Visitors for use throughout construction.

1.06 TEMPORARY WATER SERVICE

A. Provide, maintain and pay for suitable quality water service required for continued operations.

B. Extend branch piping throughout the site to provide outlets for hoses with threaded connections.

1.07 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facilities shall not be used by construction personnel.

1.08 TEMPORARY FIRE PROTECTION

A. Provide adequate number of fire extinguishers to protect the Work.

B. Comply with fire insurance and governing regulations.

C. Provide UL labeled ABC all-purpose fire extinguishers adequate in size and number.

D. Provide temporary office and storage areas with fire extinguishers.

1.09 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plant life designated to remain. Replace damaged plant life.

D. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.10 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6'-0" high fence around construction site; equip with vehicular and pedestrian gates with locks.

C. Locate gates for access to work areas, as required. Close and lock after working hours.

1.11 NOISE AND DUST CONTROL

A. Exercise controls to keep noise and dust during construction to a minimum. Traffic or construction areas shall be sprinkled with water or chemicals as required and in accordance with applicable regulatory requirements.

B. Prevent polluting the air with dust and particulate matter to meet LEED Sustainable Sites Prerequisite No. 1 in accordance with the Erosion and Sedimentation Control (ESC) plan as specified in Section 01 57 13.

C. Notify the Owner prior to using noise generating equipment in sufficient time to permit removal of occupants affected by such disturbances. Screen noisy equipment with temporary enclosures to shield adjacent areas.

1.12 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Provide construction activity pollution prevention: as indicated on Civil Drawings to meet LEED Sustainable Sites Prerequisite No. 1 in accordance with the Erosion and Sedimentation Control (ESC) plan as specified in Section 01 57 13.

1.13 EXTERIOR ENCLOSURES

A. Provide temporary weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification Sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.14 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification Sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.15 SECURITY

A. Provide security and facilities to protect Work and existing facilities, and Owner's operations from unauthorized entry, vandalism or theft.

B. Provide and pay for watchman service if necessary for adequate protection.

1.16 ACCESS ROADS

A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.

B. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Designated existing on-site roads may be used for construction traffic.

1.17 PARKING

A. Provide temporary surface parking areas to accommodate construction personnel.

B. Limit parking by construction personnel to area designated by Owner.

1.18 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Regularly remove waste materials, debris, and rubbish from site and dispose off-site. Do not allow to accumulate.

E. Construction Waste Management (Sustainable Design Projects): In accordance with Section 01 74 19 – Construction Waste Management and Disposal.

1.20 PROJECT IDENTIFICATION

A. Provide project sign in accordance with requirements of City of San Diego boilerplate or per Green Book.

B. Erect on site at location established by Resident Engineer.

C. No other signs are allowed without Resident Engineer 's permission except those required by law.

1.21 FIELD OFFICES AND SHEDS

A. Office for Resident Engineer: In accordance with City of San Diego boilerplate and Green Book.

B. Locate offices and sheds as approved by Resident Engineer.

END OF SECTION

SECTION 01 57 13

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SUMMARY

A. LEED™ Certification:

1. Contractor shall ensure that the work provided under this section will provide the construction activity pollution prevention required by the LEED "Sustainable Sites" Prerequisite. Achievement of this prerequisite requires the creation and implementation of an Erosion and Sedimentation Control (ESC) Plan for all construction activities associated with the project. The ESC Plan shall conform to the erosion and sedimentation requirements of the 2003 EPA Construction General Permit, OR local erosion and sedimentation control standards and codes, whichever is more stringent. The Plan shall describe measures implemented to accomplish the following objectives:
   a. Prevent loss of soil during construction by stormwater runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
   b. Prevent sedimentation of storm sewer or receiving streams.
   c. Prevent polluting the air with dust and particulate matter.
2. The Construction General Permit (CGP) outlines the provisions necessary t comply with Phase I and Phase II of the National Pollutant Discharge Elimination System (NP-DES) program. While the CGP only applies to construction sites greater than 1 acre, the requirements are applied to all project for the purposes of this prerequisite. Information on the EPA CGP is available at: http://cfpub.epa.gov/npdes/stormwater/cgp.cfm.

B. The Contractor shall ensure that the work provided under this section will comply with CAL GREEN 5.106.1 and Section 31 00 00 – Temporary Erosion and Sedimentation Control in these Technical Specifications.

C. The construction drawings include an Erosion Control Plan and Erosion Control details to assist the Contractor in preparation of the required documents for required submittals. The Contractor shall review these drawings to determine modifications are needed to comply with the Strom Water Discharge Permit requirements as they pertain to Contractor's construction operations. If modifications are required, the Contractor shall submit a redlined copy of the drawings to the Project Engineer for corrections. The Project Engineer will then make said corrections and return the drawings to the Contractor for submittal within five (5) working days following receipt of changes.

D. The Contractor shall comply with all requirements and conditions of the General Permit and the Water Pollution Control Plan. Failure to do so will result in the issuing of an order to suspend work in addition to the potential fines that may be assessed.

E. The Contractor responsibilities regarding maintenance of erosion control structures, after final project acceptance, will be limited to the areas disturbed by the utility and street construction for this project only. The Contactor will not be responsible for erosion control beyond the disturbed areas of this project due to adjacent construction. It is the Contractor's responsibility to document the extent of disruption due to construction activities directly related to this project. The documentation should include pictures with date stamp that is concurrent with the date of final acceptance.

1.02 SUBMITTALS - LEED

A. Submit documentation to LEED Consultant regarding erosion and sedimentation control procedures followed, including; but not limited to; memos, letters, drawings, sketches and photographs.

B. Provide monthly photographs showing the erosion and sedimentation control measures highlighted in the Erosion and Sedimentation Control Plan.

1.03 QUALITY ASSURANCE

A. It is the permittee's responsibility to perform inspections of all storm water pollution control devices on the project on a monthly basis, and within 24 hours following each rainfall of 0.50 inch or more. The Contractor is responsible for maintaining those devices in proper working order, including cleaning and/or repair. No separate payment will be made for such inspections, cleaning, or repair.

PART 2 PRODUCTS

2.01 MATERIALS

A. In accordance with Section 31 00 00 – Temporary Erosion and Sedimentation Control in these Technical Specifications and the applicable material requirements of the Civil Drawings.

PART 3 EXECUTION

A. In accordance with Section 31 00 00 – Temporary Erosion and Sedimentation Control in these Technical Specifications and the applicable details of the Civil Drawings.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 DELIVERY, STORAGE AND HANDLING

A. Deliver manufactured materials in the original packages, containers or bundles, with the seals unbroken, identified by the name and mark of the Manufacturer.

B. Deliver fabrications in as large assemblies as practicable. Fabrications specified to be shop-primed or shop-finished shall be packaged or crated as required to preserve such priming or finish intact and free from abrasion.

C. Store materials in a manner to properly protect from damage. Materials or equipment damaged by handling, weather, dirt or other cause will not be acceptable.

D. Store materials so as to cause no obstructions. Store off sidewalks, roadways, and underground services. The Contractor shall be responsible for protecting materials and equipment furnished under the Contract.

E. When a room in the Project is used as a shop or store room, the Contractor shall be responsible for all repairs, patching or cleaning necessary due to such use. Location of such storage space shall be subject to approval of the Resident Engineer.

F. Packaging shall be minimized whenever possible but shall not be reduced so as to cause damage to materials or products. Packaging shall be recycled in accordance with the requirements of Section 01 74 19 - Construction Waste Management.

1.02 SUBSTITUTIONS AND PRODUCT OPTIONS

A. For products specified only by reference standard, select product meeting that standard, by any manufacturer.

B. For products specified by naming three or more products or manufacturers, it is intended that the specified products of those manufacturers shall be furnished.

C. For products specified by naming one or more products or manufacturers and stating "or other approved," or "or approved equal,' or other such wording on Drawings or within Specifications Sections, it is intended that the products by "Acceptable Manufacturer's," which in the opinion of the Resident Engineer are equivalent to the specified product, specified by product number, may be furnished.

D. Whenever a product is specified by using a proprietary name or the name of a particular Manufacturer or Vendor, the specific item mentioned shall be understood as establishing type, function, dimension, appearance, and quality desired.

E. Other manufacturers' products will be accepted provided sufficient information is submitted to allow the Resident Engineer to determine that products proposed are equivalent to those named.

F. Prior Approvals:
1. Products, equipment and systems that have relative importance to the project (as determined by the Architect) or that are not easily substituted after award of contract may be submitted for prior approval.
2. Submittals of proposed substitution under "prior approved equal" shall be made only by the General Contractor (Prime Bidder). The Resident Engineer will not entertain direct submittals by manufacturers, suppliers or subcontractors.
3. The Resident Engineer will consider written requests by a Prime Bidder only, for substitution(s) that is/are considered equivalent to the item(s) specified.
4. The written request will be considered only if it is received at least 12 consecutive calendar days prior to the current established bid due date.
5. The prime bidder shall furnish at his own expense and on their own letterhead the necessary data per substitution request form to substantiate and validate that the physical, chemical, and operational qualities of each substitute item is such that this item will fulfill its required function.
6. The substitution, if approved, will be authorized by a written addendum under "prior approved items" to the contract documents and made available to all prime bidders.

G. Requests for approval after award of a Contract:
1. Within 30 days after award of contract, formal requests will be considered by substitutions of products in place of those specified. After the end of that period, substitution requests will be considered only if the specified product is not available (or specified product or system has been deemed illegal or dangerous by governing agencies having jurisdiction over this project) and submission shall be in the hands of the Resident Engineer a minimum of 20 days prior to date Contractor is required to place an order for the product.
2. Contractor shall request approval of such substitution, in writing, to the Resident Engineer using Document 00 63 25 - Substitution Request (After the Bidding Phase) form contained in the Technical Specifications.
3. The request shall specifically state the reason that the product is unavailable with evidence to substantiate the reason.
4. Provide documentation showing requested substitution provides sustainable design characteristics the specified product provided for achieving LEED prerequisites and credits.
5. Requests made directly to Resident Engineer by suppliers, subcontractors and distributors that are not from the Contractor will not be accepted by the Resident Engineer.
6. Resident Engineer will approve or reject substitution in writing, and in such form as the Resident Engineer directs.
7. Substitutions will not be considered if they are indicated or implied on Shop Drawings or if acceptance will require substantial revision to the Contract Documents.

H. Contractor shall submit descriptive brochures, drawings, samples and other data as is necessary to provide direct comparison to the specified materials after reviewing and determining that product meets specified requirements. Submittal shall include data for specified product in addition to data for substitution. Submittals shall be well marked and identified as to types and kind of the items being submitted for approval. Lack of sufficient information will be cause for rejection. Reference to catalogs will not be acceptable unless catalog is submitted with approval request.

I. In submitting a substitution, the Contractor makes the following representations:
1. Proposed substitution has been fully investigated and determined to be equal or superior to specified product.
2. Same warranty will be furnished for proposed substitution as for specified product.
3. Same maintenance service and source of replacement parts, as applicable, is available.
4. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
5. Proposed substitution shall provide sustainable design characteristics the specified product provided for achieving LEED prerequisites and credits.
6. Cost data included on the substitution request is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
6. Proposed substitution does not affect dimensions and functional clearances.
7. Payment will be made for changes to building design, including A/E design, detailing, and construction costs by the substitution.
8. Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

J. See also Section 01 35 43 - Environmental Procedures for substitution of green materials.

1.03 RECYCLED CONTENT

A. LEED™ Certification: Contractor shall ensure that the work provided will include recycled content materials to achieve Materials & Resources Credit 4, option 1 and option 2.
1. Credit MRc4 option.1 requires use of materials with recycled content such that post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of the total value of the materials in the project.
a. The value of the recycled content portion of a material or furnishing shall be determined by dividing the weight of recycled content in the item by the total weight of all material in the item, then multiplying the resulting percentage by the total value of the item.
b. Mechanical, electrical and plumbing components, and specialty items such as elevators shall not be included in this calculation.
2. Credit MRc4, option 2 (one point) requires that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes an additional 10% beyond MR Credit 4, option 1 (total of 20% based on cost) of the total value of the materials in the project.

B. Submittals – LEED (for Recycled Content): Contractor shall download, complete and upload the Materials and Resource Calculator (found under “Credit Resource” on LEED-OnLine) to document sustainable criteria values for MR Credit 3-7. The following project data and calculation information is required to document credit compliance:
1. Provide the total project’s materials cost (Divisions 2-10) or provide the total cost (Divisions 2-10) to apply the 45% default materials value.
2. Provide a tabulation of each material used on the project that is being tracked for recycled content. The tabulation must include a description of the material, the manufacturer of the material, the product cost, the pre-consumer and/or post-consumer percentage and the source of the recycled content.
3. Provide an optional narrative describing any special circumstances or special conditions regarding the project’s credit approach.

C. Materials Containing Recycled Content: Recycled content materials shall be defined in accordance with the International Organization for Standardization document, *ISO 14021 – Environmental labels and declarations – Self declared environmental claims (Type II environmental labeling)*.

1. Concrete and cementitious materials containing fly ash as specified in Section 03 05 05:
   a. Section 03 30 00 - Cast-In Place Concrete.
   b. Section 04 05 15 - Mortar and Masonry Grout.
   c. Section 09 24 00 - Portland Cement Plaster (Stucco)
2. Materials containing recycled steel:
   a. Section 03 20 00 – Concrete Reinforcement
   b. Section 05 10 00 – Structural Metal Framing.
   c. Section 05 31 00 – Steel Deck.
   d. Section 05 41 00 – Load-Bearing Metal Stud System
   e. Section 05 50 00 – Metal Fabrications.
   f. Section 05 51 00 – Steel Stairs
   g. Section 05 52 00 – Handrails and Ralings
   h. Section 05 70 00 – Ornamental Metals
   i. Section 07 60 00 – Flashing and Sheet Metal
   j. Section 08 11 13 – Steel Doors and Frames
   k Section 09 22 16 – Non-Structural Metal Framing
3. Other materials as specified throughout the Technical Specifications. (The following are examples)
   a. Section 06 10 53 – Miscellaneous Carpentry
   b. Section 06 20 00 – Finish Carpentry
   c. Section 06 40 00 – Architectural Woodwork
   d. Section 08 41 13 - Aluminum Entrances and Storefronts
   e. Section 09 29 00 - Gypsum Board.
   f, Section 09 30 00 - Tile
   g. Section 09 51 00 – Acoustical Ceilings
   h. Section 09 91 00 – Paint.
4. Other materials as recommended by Contractor to achieve requirements specified in Section 01 81 13.

D. Mechanical and electrical components shall not be included in the calculations for this Credit.

1.04 REGIONAL MATERIALS

A. LEED™ Certification: Contractor shall ensure that the work provided will include regional Materials to achieve Materials & Resources Credit 5, options 1 and 2.

1. Credit MRc5, option 1 (one point) requires that 10% of building materials (based on cost) have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project.
   a. Mechanical, electrical and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation.
   b. Only include materials permanently installed in the project.
   c. Furniture may be included, providing it is included consistently in MR Credits 3-7.
2. Credit MRc5, option 2 (one point) requires that an additional 10% of the building materials beyond MR Credit 5, option 1 (total of 20% based on cost) have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project.

B. Submittals – LEED (for Regional Materials): Contractor shall download, complete and upload the Materials and Resource Calculator (found under "Credit Resource" on LEED-OnLine) to document sustainable criteria values for MR Credit 3-7. The following project data and calculation information is required to document credit compliance:
   1. Provide the project's total cost (for application of 45% default factor) or total materials cost (note this reported value must be consistence across all MR credits.)
   2. Complete the regional materials calculation table in the submittal template.
   3. Provide an optional narrative describing any special circumstances or special conditions regarding the project's credit approach.

C. Regional Materials:
   1. Earthwork and site utilities as specified in Section 31200 – Earthwork for Structures and Pavements.
   2. Concrete and cementitious materials as specified in:
      a. Section 03 30 00 - Cast-In Place Concrete.
      b. Section 04 05 15 - Mortar and Masonry Grout.
      c. Section 09 24 00 - Portland Cement Plaster (Stucco)
   3. Materials containing steel components that are locally fabricated:
      a. Section 03 20 00 – Concrete Reinforcement
      b. Section 05 10 00 – Structural Metal Framing.
      c. Section 05 31 00 – Steel Deck.
      d. Section 05 41 00 – Load-Bearing Metal Stud System
      e. Section 05 50 00 – Metal Fabrications.
      f. Section 05 51 00 – Steel Stairs
      g. Section 05 52 00 – Handrails and Ralings
      h. Section 05 70 00 – Ornamental Metals
      i. Section 07 60 00 – Flashing and Sheet Metal
      j. Section 08 11 13 – Steel Doors and Frames
      kl Section 09 22 16 – Non-Structural Metal Framing
   4. Other materials as specified throughout the Technical Specifications. (The following are examples)
      a. Section 06 10 53 – Miscellaneous Carpentry
      b. Section 06 20 00 – Finish Carpentry
      c. Section 06 40 00 – Architectural Woodwork
      d. Section 08 41 13 - Aluminum Entrances and Storefronts
      e. Section 09 29 00 - Gypsum Board.
      f, Section 09 30 00 - Tile
      g. Section 09 51 00 – Acoustical Ceilings
      h. Section 09 91 00 – Paint.
   4. Other materials as recommended by Contractor to achieve requirements specified in Section 01 81 13.

D. Mechanical and electrical components shall not be included in the calculations for this Credit.

1.05 RAPIDLY RENEWABLE MATERIALS

A. LEED™ Certification: Contractor shall attempt to include materials and products to achieve Materials & Resources Credit 6 which requires that rapidly renewable materials (made from plants that are typically harvested within a ten-year cycle or shorter) are used in the project for 2.5% of the total value of all building materials and products, based on cost.

B. Submittals – LEED (for Rapidly Renewable Materials): Contractor shall download, complete and upload the Materials and Resource Calculator (found under "Credit Resource" on LEED-OnLine) to document sustainable criteria values for MR Credit 3-7. The following project data and calculation information is required to document credit compliance:
1. Provide the project's total cost (for application of 2.5% default factor) or total materials cost (note this reported value must be consistence across all MR credits.)
2. Complete the rapidly renewable materials calculation table in the Materials and Resource Calculator.
3. Provide an optional narrative describing any special circumstances or special conditions regarding the project's credit approach.

C. Rapidly Renewable Materials:
1. Materials as specified throughout the Technical Specifications. (The following are examples):
   a. Section 06 10 53 - Miscellaneous Carpentry
   b. Section 06 20 00 - Finish Carpentry
   c. Section 06 40 00 - Architectural Woodwork
   d. Section 07 42 43.13 - Solid Composite Exterior Wall Panels
2. Other materials as recommended by Contractor to achieve requirements specified in Section 01 81 13.

1.06 LOW-EMITTING MATERIALS

A. LEED™ Certification: Contractor shall ensure that the work provided under this section will provide Low-Emitting Materials to achieve Indoor Environmental Quality Credit 4.1, 4.2, 4.3, and 4.4.
1. Credit EQc 4.1 requires that adhesives and sealants used on the interior of the building (defined as inside of the weatherproofing systems and applied on-site) shall comply with the requirements of the following reference standards:
   a. Adhesives, Sealants and Sealant Primer: South Coast Air Quality Management District (SCAQMD) Rule #1168. Contractor shall comply with VOC limits as required by LEED OnLine to achieve this credit.
   b. Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on October 19, 2000. Contractor shall comply with VOC limits as required by LEED OnLine to achieve this credit.
   c. Materials that must comply with these requirements include, but are not limited to:
      1) Adhesives specified in various sections of the specifications.
      2) Sealants as specified in Section 07 92 00
2. Credit EQc 4.2 requires that paints and coatings used on the interior of the building (defined as inside of the weatherproofing systems and applied on-site) shall comply with the requirements of the following criteria:
   a. Architectural paints, coatings and primers applied to interior walls and ceilings: Do not exceed the VOC content limits established in Green Seal Standard GS-11, Paint, First Edition, May 20, 1993. Contractor shall comply with VOC limits as required by LEED OnLine to achieve this credit.
   b. Anti-corrosive and anti-rust paints applied to interior ferrous metal substrate: Do not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, anti-Corrosive Pints, Second Edition, January 7, 1997. Contractor shall comply with VOC limits as required by LEED OnLine to achieve this credit.

c. Clear wood finishes, floor coatings, stains, sealers and shellacs applied to interior elements: Do not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coating, rules in effect on January 1, 2004. Contractor shall comply with VOC limits as required by LEED OnLine to achieve this credit.

d. Materials that must comply with these requirements include, but are not limited to:
   1) Primers for steel specified in Sections 05 10 00 and 05 50 00.
   2) Stains and sealers specified in Section 06 40 00
   3) Interior paints as specified in Section 09 91 00.
   4) Other clear wood finishes, floor coatings, sealers and stains specified elsewhere in the Technical Specifications.

3. Credit EQc 4.3 requires that:
   a. Carpet installed in the building interior shall meet the testing and product requirements of the Carpet and Rug Institute's Green Label Plus program.
   b. Carpet cushion installed in the building interior shall meet the requirements of the Carpet and Rug Institute Green Label program.
   c. Carpet adhesive shall meet the requirements of EQ Credit 4.1. Contractor shall comply with VOC limits as required by LEED OnLine to achieve this credit.
   d. All hard surface flooring must meet the requirements of the FloorScore standard (current as of the date of this rating system, or more stringent version) as shown with testing by an independent third-party. Mineral-based finish flooring products such as tile, masonry, terrazzo, and cut stone without integral organic-based coatings and sealants and unfinished/untreated solid wood flooring qualify for credit without any IAQ testing requirements. However, associated site-applied adhesives, grouts, finishes and sealers must be compliant for a mineral-based or unfinished/untreated solid wood flooring system to qualify for credit.
   e. Concrete, wood, bamboo and cork floor finishes such as sealer, stain and finish must meet the requirements of South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.
   f. Tile setting adhesives and grout must meet South Coast Air Quality Management District (SCAQMD) Rule 1168. VOC limits correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005.

4. Credit EQc 4.4 requires that wood and agrifiber products used on the interior of the building (defined as inside of the weatherproofing systems and applied on-site) must contain no added urea-formaldehyde resins and that laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.
   a. Materials that must comply with these requirements include, but are not limited to:
      1) Composite wood products applied on-site inside the building weatherproofing systems such as sheathing, doors, and other structural and non-structural applications.
      2) Wood doors as specified in Section 08 14 00.

B. Submittals – LEED (for Low Emitting Materials): Contractor shall submit a completed LEED-NC 2009 form and supporting documentation for LEED IEQc4.1, 4.2, 4.3 and 4.4 to the Architect to be included with the comprehensive "Construction Submittal." The following project data and calculation information is required to document credit compliance using version 2.2 credit templates:

1. LEED IEQc4.1
   a. Provide a listing of each indoor adhesive, sealant and sealant primer product used on the project. Include the manufacturer's name, product name, specific VOC data (in g/L, less water) for each product, and the corresponding allowable VOC from the referenced standard.
   b. Provide a listing of each indoor aerosol adhesive product used on the project. Include the manufacturer's name, product name, specific VOC data (in g/L, less water) for each product, and the corresponding allowable VOC from the referenced standard.
   c. Provide a narrative to describe any special circumstances or non-standard compliance paths taken by the project.
2. LEED IEQc4.2
   a. Provide a listing of each indoor paint and coating used on the project. Include the manufacturer's name, product name, specific VOC data (in g/L) for each product, and the corresponding allowable VOC from the referenced standard.
   b. Provide a narrative to describe any special circumstances or non-standard compliance paths taken by the project.
3. LEED IEQc4.3
   a. Provide a listing of each carpet product installed in the building interior. Confirm that the product complies with the CRI Green Label Plus testing program.
   b. Provide a listing of each carpet cushion product installed in the building interior. Confirm that the product complies with the CRI Green Label Plus testing program.
   c. Provide a narrative to describe any special circumstances or non-standard compliance paths taken by the project.
4. LEED IEQc4.4
   a. Provide a listing of each wood and agrifiber product installed in the building interior noting whether added urea-formaldehyde is included in the product.
   b. Provide a narrative to describe any special circumstances or non-standard compliance paths taken by the project.

C. The Contractor shall ensure that the materials provided under this section will comply with CAL GREEN 5.504.4.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cutting, fitting and patching, including attendant excavation and backfill required to complete Work, and for:
   1. Making several parts fit together properly.
   2. Uncovering portions of Work to provide for installation of ill-timed Work.
   3. Removing and replacing defective and non-conforming Work.
   4. Removing samples of installed Work required for testing, as directed by Resident Engineer.
   5. Providing routine penetrations of non-structural surfaces for installation of piping and electrical conduit.
   6. Attaching new materials to existing remodeling areas.

1.02 SUBMITTALS

A. **In advance of executing any cutting or alterations**, submit written request to Resident Engineer requesting consent to proceed with cutting which affects:
   1. Work of Owner or other trades.
   2. Structural value or integrity of any element of Project.
   3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
   4. Efficiency, operational life, maintenance or safety of operational elements.
   5. Visual qualities of sight-exposed elements.

B. Include in request:
   1. Identification of Project.
   2. Description of affected Work.
   3. Necessity for cutting, alteration or excavation.
   4. Effect of Work of Owner or other trades, or structural or weatherproof integrity of Project.
   5. Description of proposed Work:
      a. Scope of cutting, patching, alteration, or excavation.
      b. Trades which will execute Work.
      c. Products proposed to be used.
      d. Extent of refinishing to be done.
   6. Alternatives to cutting and patching.
   7. Cost proposal, when applicable.
   8. Written permission of trades whose Work will be affected.

C. Submit written notice to Resident Engineer designating time Work will be uncovered to provide for observation.

1.03 PAYMENT FOR COSTS

A. Cost caused by ill-timed or defective Work or Work not conforming to Contract Documents shall be paid by Contractor.

B. Cost of Work done on written instructions of Resident Engineer, other than defective or nonconforming Work, will be paid by Owner on approval of written Change Order. Provide written cost proposals prior to proceeding with cutting and patching proposed by Resident Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide for replacement of Work removed. Comply with Contract Documents for type of Work standards and Specification requirements for each specific product involved.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of Work, including elements subject to movement or damage during cutting and patching, and excavating and backfilling. After uncovering Work, inspect conditions affecting installation of new products and verify procedures with Resident Engineer.

B. Report unsatisfactory or questionable conditions in writing to Resident Engineer. Do not proceed with Work until further instructions are received.

3.02 PREPARATION

A. Provide shoring, bracing and supports as required to maintain structural integrity of Work.

B. Provide devices and methods to protect other portions of Work from damage, including elements which may be exposed by cutting and patching Work. Maintain excavations free from water.

3.03 ERECTION, INSTALLATION AND APPLICATION

A. Performance:
1. Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.
2. Execute cutting and demolition by methods which prevent damage to other Work to provide proper surfaces to receive installation of repairs and new Work.
3. Execute excavating and backfilling by methods which prevent damage to other Work and settlement as specified in Section 31200.

B. Employ original installer or fabricator to perform cutting and patching for:
1. Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants and waterproofing.
2. Sight-exposed finished surfaces.

C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes as shown on Drawings and as specified.

D. Fit Work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces. Conform to fire code requirements for penetrations and maintain integrity of fire walls and ceilings.

E. Restore Work which has been cut or removed. Install new products to provide completed Work in accordance with requirements of Contract Documents and as required to match surrounding areas and surfaces.

F. Refinish entire surfaces as necessary to provide an even, matching finish as follows:
1. Painted Walls or Ceilings: To nearest intersection with another finish or corner.
2. Where Applied Finishes Occur (i.e wallcovering, tile, wood paneling): To nearest intersection of finish without damage to adjacent material. Where match of pattern, grain, texture, or similar finish cannot be made, refinish area to intersection with other finish or corner.
3. Manufactured or Shop Fabricated Materials: Replace entire affected surface or material.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 SUMMARY

A. The Owner has established that this Project shall minimize the creation of construction and demolition waste on the job site.
   1. Factors that contribute to waste such as over packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination, shall be minimized.
   2. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled.
   3. Waste disposal in landfills shall be minimized.

B. LEED™ Certification: Contractor shall ensure that the work provided under this section will provide Construction Waste Management to achieve Materials & Resources Credit 2, options 1 and 2 (with goal of 75% minimum diversion from landfill).
   1. Credit MRc2, option1 (one point) requires recycling and/or salvaging at least 50% of non-hazardous construction and demolition. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or commingled.
   2. Credit MRc2, option 2 (one point) requires recycling and/or salvaging of an additional 25% beyond MR Credit 2, option1 (75% total) of non-hazardous construction and demolition, debris.
   3. Excavated soil and land-clearing debris does not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout.

C. The Contractor shall ensure that the procedures provided under this section will comply with CAL GREEN 5.508 and with Section 702 – Construction and Demolition Waste Management of the Whitebook.

1.02 SUBMITTALS

A. Waste Management Plan: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any waste removal, whichever occurs sooner, the Contractor shall submit to the Resident Engineer a Waste Management Plan. The Plan shall contain the following:
   1. List of federal, state, and local laws, regulations, and permits concerning hazardous materials, construction and demolition waste, chemical waste, and sanitary waste that are applicable to the Contractor's proposed operations.
   2. Estimate of total project waste to be generated, name of the landfill(s) where Project waste would normally be disposed of, tipping fees, and estimated cost of disposing of project waste in landfill(s).
   3. Estimate total tons or cubic yardage of the following waste category to be diverted from landfill.
      a. Concrete
      b. Masonry
      c. Other

4. Estimate of total tons or cubic yards of the following waste categories to be diverted from landfill.
   a. Clean dimensional wood, palette wood
   b. Plywood, OSB, and particleboard
   c. Cardboard, paper, packaging
   d. Gypsum board (used on site as compost)
   e. Other
5. Estimate of amounts (weight, feet, square yards, gallons, etc.) of the following waste categories.
   a. Metals
   b. Paint
   c. Other
6. Estimate of net cost savings or additional costs resulting from separating and recycling (versus landfilling) each material. “Net” means that the following have been subtracted from the cost of separating and recycling:
   a. Revenue from the sale of recycled or salvaged materials.
   b. Landfill tipping fees saved due to diversion of materials from the landfill.
7. Transportation: A description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of materials. Provide an estimate of how often bins will need to be emptied.
8. Waste Management Plan shall be included under “Materials & Resources Credit 2.1 and 2.2 - Construction Waste Management” in the LEED™ Submittal Documentation in accordance with Section 01 81 13.

B. Calculation: Provide calculations (using Table MRc2-1 on LEED-OnLine) on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that specified percentage of construction wastes were recycled or salvaged. Contractor shall download, complete and upload the information required to document sustainable criteria values for MR Credit 2 directly on LEED-OnLine.

C. Submittal with Application for Progress Payments: The Contractor shall submit with each Application for Progress Payment a Summary of the project waste generated. Failure to submit this information shall render the Application for Payment incomplete and shall delay Progress Payment. The Summary shall contain the following information:
1. The amount (in tons or cubic yards) of material landfilled from the Project, the identity of the landfill, the total amount of tipping fees paid at the landfill, and the total disposal cost. Include manifests, weight tickets, receipt, and invoices.
2. For each material recycled, reused, or salvaged from the Project, include the amount (in tons or cubic yards, pounds, feet, square yards, gallons, etc.), the date removed from the job site, the receiving party, the transportation cost, the amount of any money paid or received for the recycled or salvaged material, and the net total cost or savings of salvage or recycling each material. Attach manifests, weight tickets, receipts, and or invoices.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Plan Distribution: The Contractor shall provide copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, and the Resident Engineer shall receive 3 copies.

B. Instruction: The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.

C. Meetings: Contractor shall conduct Construction Waste Management meetings. Meetings shall include subcontractors affected by the Waste Management Plan. At a minimum, waste management goals and issues shall be discussed at the following meetings:
1. Pre-bid meetings.
2. Pre-construction meeting.
3. Regularly scheduled job-site meetings.

D. Separation facilities: The Contractor shall designate a specific area or areas to facilitate separation of materials for potential reuse, salvage, recycling, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid commingling of materials. Bins shall be protected during non-working hours from off site contamination. Signage on bins, dumpsters and other collection receptacles shall be in English and in Spanish.

E. Materials Handling Procedures: Materials to be recycled shall be protected from contamination, and shall be handled, stored and transported in a manner that meets the requirements set by the designated facilities for acceptance.
1. Clean contaminated materials prior to placing in collection containers.
2. Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
3. Arrange for collection by or delivery to the appropriate recycling or reuse facility.

F. Hazardous wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

G. Food Wastes: Food wastes (including packaging and wrappers) shall be properly disposed of immediately and shall be removed daily to minimize or eliminate the attraction of animals.

H. Rebates, tax credits, and other savings obtained for recycled or reused materials accrue to Contractor.

3.02 WASTE MANAGEMENT OPERATIONS

A. The following waste categories, at a minimum, shall be separated and diverted from landfill. Appropriately sized, separate collection bins or containers, labeled (in both English and Spanish) for the particular waste categories identified below, shall be provided as follows:
1. Wood:
   a. Land clearing debris (trees).
   b. Clean dimensional wood, palette wood.
   c. Plywood, OSB, and particleboard.
2. Concrete. Crushed on-site and reused as aggregate when feasible.
3. Asphaltic Concrete. .

4. Cardboard, paper, packaging.
5. Cement fiber products (shingles, panels, siding).
6. Asphalt roofing shingles.
7. Metals.
   a. Ferrous.
   b. Aluminum.
   c. Other non-ferrous.
8. Gypsum Drywall (unpainted). (This is may be used on site as compost)
9. Paint.
10. Rigid Foam.
11. Glass.
12. Plastics (#1 and #2)
    a. Polyethylene terephthalate (PET). (#1)
    b. High-density polyethylene (HDPE). (#2)
13. Beverage containers.
14. Insulation
15. Others as appropriate.

B. Recycling/Reuse Centers: Implement a recycling/reuse program that includes separate collection of Reusable building materials, including (but not necessarily limited to) lumber, structural steel, miscellaneous hardware and plumbing and electrical fixtures.The following is a partial list for contractor's information only.
   1. Reusable Building Materials:
      a. Habitat for Humanity, (800) HABITAT.
      b. California Materials Exchange (CAL-MAX) Program sponsored by the California Integrated Waste Management Board.
         1. CAL-MAX is a free service provided by the California Integrated Waste Management Board, division of the California Environmental Protection Agency, designed to help businesses find markets for materials that traditionally would be discarded. The premise of the CAL-MAX Program is that material discarded by one business may be a resource for another business.
         2. To obtain a current Materials Listings Catalog:
            a) call CalRecycle Local Assistance and Market Development (916) 341-6199
            b. See http://www.calrecycle.ca.gov/calmax/
   2. Asphalt: For information on recycling/reuse of asphalt, contact the Asphalt Recycling and Reclaiming Association (410) 267-0023.
   3. Wood (lumber, trees, etc.): Wood Recycling, Inc. (www.woodrecycling.com)
   4. Plastics Only:
      a. (information) Vinyl Environmental Resource Center of the Vinyl Institute; (800) 969-8469
      b. (information) American Plastics Council (800) 2-HELP-90.
   5. Plastic "peanut" packing materials: (information) The Association of Foam Packaging Recyclers (202) 974-5351.
   6. Used Paint and Used Paint Cans:
      a. Green Paint Company (800) 527-8866.
      b. (public and private agencies only) Major Paint Company (310) 542-7701.
      c. (paint cans only - information) Steel Can Recycling Institute (SCRI); (800) 937-1226

7. Fluorescent and HID lamps and ballasts.
   a. AERC.com, Inc., Hayward, CA (800) 628-3675, www.aercrecycling.com
   b. Ecolights Northwest, Seattle, WA (206) 343-1247, www.ecolights.com
   c. Environmental Light Recyclers, Inc., Fort Worth, TX (800) 755-4117.
   d. Full Circle Recyclers, Bronx, NY (800) 775-1516, www.fcrecyclers.com
   e. HTR-Group, Lake Ozark, MO (888) 537-4874, www.htr-group.com
   f. Institution Recycling Network, Concord, NH (603) 229-1962, www.ir-network.com.
   g. Northeast Lamp Recycling, Inc., East Windsor, CT (860) 292-1992
   h. Onyx special Services, Port Washington, WI (800) 556-5267, www.superiorserv.com.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 FINAL CLEANING

A. Perform the following special cleaning for trades at completion of Work. Employ experienced workmen or professional cleaners for the final cleaning:
   1. Remove marks, stains, fingerprints, soil and dirt from paint, stain and wall covering.
   2. Remove spots, soil, paint and mastic from tile work and wash same.
   3. Clean fixtures, equipment and piping; remove stains, paint, dirt and dust.
   4. Remove temporary floor protections; clean and polish floors.
   5. Clean concrete walks and slabs of plaster or cement droppings, paint and other objectionable materials to present a neat, clean appearance.
   6. Clean exterior and interior metal surfaces, including doors and windows and their frames.
   7. Remove oil, stains, dust, dirt, paint and the like from items required to have a polished finish; polish and leave without fingermarks or other blemishes.
   8. Wash glass inside and outside.

B. Cleaning materials and procedures shall be non-toxic and in accordance with the requirements of Section 01 81 13. Provide alternative materials to more toxic commercial cleaning agents, including; but not limited to: vinegar, citrus, borax, cornstarch, and baking soda.
   1. Abrasive cleaners: Substitute half lemon dipped in borax.
   2. Ammonia: Substitute vinegar, salt, and water mixture; or backing soda and water.
   3. Disinfectants: Substitute half cup borax in a gallon of water.
   4. Drain Cleaners: Substitute one-fourth cup baking soda and one-fourth cup vinegar in boiling water.
   5. Upholstery cleaners: Substitute dry cornstarch.

C. Make building(s) ready for occupancy in every respect. Lay heavy building paper (rosin paper or kraft paper ONLY, asphaltic based papers are NOT acceptable) in main circulation areas to protect the floors until final inspection and acceptance.

D. Existing improvements, inside or outside the property which are disturbed, damaged or destroyed by the Work under the Contract shall be restored to the condition in which they originally were, or to the satisfaction of the Resident Engineer.

1.02 CONSTRUCTION IAQ MANAGEMENT PLAN (LEED EQ Credit No. 3.2)

A. In accordance with requirements specified in Section 01 35 46 – Indoor Air Quality Management.

1.03 PROJECT RECORD DOCUMENTS

A. As the work progresses, the Contractor shall maintain a complete and accurate record of changes or deviations from the Contract Documents and Shop Drawings, indicating the Work as actually installed. Record information in the appropriate locations on a record set of prints of the Drawings and Shop Drawings and a copy of the Specifications which are maintained solely for the purpose of this documentation. Keep this record set of Contract Documents and Shop Drawings at the project site for review by the Owner and Architect. Information contained in the record documents shall include, but not be limited to:

1. Modifications made by Addenda, Change Orders, Construction Change Directives and Resident Engineer's Supplemental Instructions which shall be transferred to the record documents.
2. Location of site underground pipes, conduits, ducts, cables and similar work, dimensioned horizontally to permanent points of reference and located vertically by indicating depth of burial. Dimensions shall be accurate within ±6 inches.
3. Location of building plumbing piping, sprinkler piping, control valves, heating and air conditioning equipment, mechanical piping, ductwork, major conduit runs, power, control and alarm wiring, etc., dimensioned horizontally to permanent points of reference. Dimensions shall be accurate within 6 inches. By notation, describe the vertical location of the item such as "below slab," "above ceiling," etc.
4. Modifications made to accommodate field conditions.
5. Location and function of mechanical and electrical control devices and shut-off valves.
6. Revise Drawings and panel schedules to show final circuiting of electrical fixtures and equipment.

B. The Resident Engineer will provide the Contractor with a set of reproducible drawings, of the complete original bidding documents, at Contractor's expense. Seals and signatures of Registrants shall be completely removed and/or permanently obscured. Contractor shall provide the following on the Drawings:

1. Changes in the Contract Documents, secured with prior approval of the Resident Engineer, recorded in a neat readable manner, in black ink, by a competent drafter. Deletions shall be made by erasure or sepia eradicator only.
2. Prior to application for final payment, transfer all changes, information and notations made to the record prints to a reproducible set.

C. Upon Substantial Completion of the Work, deliver the complete set of Record Documents including prints, reproducible set, Shop Drawings and annotated Specifications to the Resident Engineer for approval.

D. Owner's Manual: Prior to final payment, submit one (1) hard-back, loose-leaf binder containing the following required submittals and any others required in other Sections, suitably typed, indexed and labeled for ready reference:

1. Subcontractors, major suppliers list with companies names, addresses and telephone numbers.
2. Warranties and certifications.
3. Affidavit from general and subcontractors on use of asbestos free materials.
4. Maintenance/operation instructions and parts list (other than Divisions 15 and 16).
5. List of Extra Materials supplied to Owner, signed by Owner's representative.
6. Other items required by the Specifications.
7. Electronic copy of documents on CD and/or DVD.

E. LEED Submission Documentation: In accordance with Section 01 81 13.

1.04 OPERATION AND MAINTENANCE DATA

A. Initial Submittal:
1. Submit two draft copies of Operating and Maintenance Manuals for systems and equipment, including electrical and control items, and parts lists, a minimum of 14 days prior to requesting inspection for Substantial Completion, or scheduled Substantial Completion Date, whichever is earlier. Furnish separate copies for each Division.
2. Resident Engineer will review Manual for general scope and content and return one copy of draft manuals with required action.

B. Operating instructions shall include complete operating sequence, control diagrams, description of method of operating machinery, machine serial numbers, factory order numbers, parts, tests, instruction books, suppliers phone numbers and addresses and individual equipment guarantees. Parts lists shall be complete in every respect, showing parts and part numbers for ready reference.

C. Maintenance instructions shall include a written list of required and suggested maintenance for mechanical, plumbing, electrical or other equipment or features in the project. Each item shall contain a brief description of the maintenance required as well as the recommended time frame or period for the maintenance. Include lists of filter sizes for air handling equipment, indicated "washable" or "disposable" and for which unit the filter is for. Shut off valves, etc., must be clearly marked on as-constructed drawings.

D. Where available from the manufacturer, provide operating and maintenance instructions and videos on electronic media for each specific equipment item or system.

E. Assemble maintenance manual and operating instructions in hard back loose leaf binders. Suitably label and index material for ready reference.

F. Upon substantial completion of the Project Work, submit one copy of the Maintenance Manual and Operating Instructions to the Resident Engineer for approval. Upon receipt of Notice of Approval, deliver the additional copy to the Owner. Include operating and maintenance instruction and videos on electronic media.

1.05 SPARE PARTS AND MAINTENANCE MATERIALS

A. Deliver spare parts, tools, extra stocks of material and similar physical items required by individual specification sections to the Owner with a copy of the transmittal to the Owner. Obtain signed receipts from the Owner for all items.

B. Change over construction locks to permanent keying system. Deliver required number of keys to the Owner with a copy of the transmittal to the Resident Engineer. Obtain receipts from the Owner for delivered items.

1.06 ELECTRONIC COPIES OF IMAGE DOCUMENTS

A. Upon completion provide CD or DVD disk(s) containing image copies in JPEG, PDF or other appropriate electronic format of all record and maintenance documents.

1.07 WARRANTIES

A. Provide duplicate, notarized copies of documents required in the General Conditions.

B. Submit warranties required by individual specification Sections in duplicate, assembled in durable binders with a Table of Contents.

C. The date of commencement of warranties shall be the date of Substantial Completion except as may be modified by AIA Document G-704, Certificate of Substantial Completion, or by other written agreement with the Owner.

END OF SECTION

SECTION 01 81 31

SUSTAINABLE DESIGN REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Procedures required of the Contractor to ensure that construction procedures and documentation required for LEED™ Certification and CALGreen are provided.

1.02 DEFINITIONS

A. LEED Green Building Rating System:
1. "LEED™": Leadership in Energy and Environmental Design.
2. "USGBC": US Green Building Council. See Section 01 42 00 - References.
3. “GBCI”: Green Building Certification Institute.
4. “CALGreen”: 2010 Title 24, Part 11, California Green Building Standards Code.

B. Prerequisite: Requirements which must be met in order to achieve LEED™ Certification. Non-compliance with any prerequisite may be cause for failure of Certification and is not acceptable.

1.03 SYSTEM DESCRIPTION

A. LEED™ Certification:
1. The LEED Green Building Rating System™ is a voluntary, consensus-based, market-driven building rating system based on existing proven technology. It evaluates environmental performance from a whole building perspective over a building's life cycle, providing a definitive standard for what constitutes a "green building".
2. The development of LEED Green Building Rating System™ was initiated by the USGBC Membership, representing all segments of the building industry and has been open to public scrutiny.
3. In 2008, the review of the submittals for building certification was changed to the GBCI.
4. LEED™ is a measurement system designed for rating new and existing commercial, institutional, and residential buildings. It is based on accepted energy and environmental principles and strikes a balance between known established practices and emerging concepts. It is a performance-oriented system where credits are earned for satisfying criterion designed to address specific environmental impacts inherent in the design, construction and O&M of buildings. Different levels of green building certification are awarded based on the total credits earned. The system is designed to be comprehensive in scope, yet simple in operation.
5. There are a total of 110 points available in the LEED-NC v3 (2009) rating system.
   a. 40 points are required for a building to be LEED Certified.
   b. 50 points: "Silver Level" rating.
   c. 60 points: "Gold Level" rating.
   d. 80 points: "Platinum Level" rating
6. The Owner of this project intends to achieve a Silver Level rating in accordance with the Project Checklist which follows this section.
7. Information regarding the LEED rating system is available at http://new.usgbc.org/leed/rating-systems

B. CALGreen Compliance: The California Green Building Code (CALGreen) went into effect January 1, 2011 and the mandatory provisions are applicable to this project. Informaiton regarding CALGreen is available at http://www.bsc.ca.gov/Home/CALGreen.aspx

1.04 SUBMITTALS

A. LEED™ Submittal Documentation:
1. Upon completion of the Project, the Owner will be making a submission to the GBCI for certification. This submission will require documentation provided by the Contractor.
2. Throughout the Technical Specifications, various submission requirements are specified that shall be collected and compiled into a separate file by the Contractor prior to, during, and after the course of construction.
3. Product data required for LEED submittal shall be submitted electronically to LEED-OnLine concurrent with the submittals to the Resident Engineer.
4. LEED-OnLine:
a. At the time of Project Registration during the design phase of the project, the project team identified a Project Administrator (GrEn A/E Consultants LLC), who has assigned design team members to each applicable LEED prerequisite/credit.
b. Upon execution of Contract, the Contractor will be invited to participate in the LEED-Online process. Contractor shall accept the assignments and shall cooperate and participate in the preparation of the LEED Templates at no additional cost to the Owner. Prerequisites/credits that are noted as “Assign” in the Assignee column of the LEED-OnLine scorecard will be those assigned to the Contractor.
c. The Contractor shall complete the LEED-OnLine documentation (forms and supporting documentation) which is assigned to the Contractor. The Project Administrator shall review periodically to ensure that the documentation provided has been uploaded. The Project Administrator will provide familiarization assistance to the Contractor, however, the Contractor shall be responsible for the training of Contractor’s personnel in the usage of LEED-Online.
d. Once each prerequisite/credit is completed, the Project Administrator will submit the project for review at the appropriate time.
e. Credits marked as "Construction" will be submitted and reviewed by GBCI after the substantial completion of construction. The GBCI will review and mark each credit as "Anticipated/Achieved," “Pending” or "Denied". Project team members may be contacted for additional information or clarification for claiming the credit and meeting the credit intent and shall assist the Project Administrator in any resubmittal required. The design/construct team will receive a ruling on every credit that is submitted, with a brief explanation of why any credits are pending or were denied. The certification review process will be documented in the LEED-Online exclusively.
f. Should clarification be required of a prerequisite or credit assigned to the Contractor, the Contractor shall provide the required response to that clarification request by GBCI.
g. The design/construct team will receive a ruling on every credit that is submitted, with a brief explanation of why any credits were denied. The certification review process will be documented in the LEED-Online exclusively.

h. Certification Award: The results of the Design Submittal and Construction Submittal will be combined to determine project certification and the corresponding rating level (Certified, Silver, Gold, Platinum). Notification of the project's LEED Rating will be made via the LEED-Online by USGBC/GBCI certification staff. The project team may choose to accept the rating or appeal one or more credits.

i. Appeals: If any party decides to appeal a certification ruling, the project will be assigned to another USGBC/GBCI Reviewer. The new USGBC/GBCI Reviewer will examine the credit information provided in the LEED-Online and any additional information provided in the Appeal Notification. Within 10 days of appeal, the appeal reviewer will make a final determination. Should appeal of a prerequisite/credit to which the Contractor is assigned be required, the additional costs and fees shall be borne by the Contractor. If a Prerequisite assigned to the Contractor be denied, the Contractor shall appeal the denial at no additional cost to Owner. The appeal process shall be completed so that the prerequisite is attained.

B. Erosion and Sedimentation Control - Sustainable Sites Prerequisite: Provide electronically submittals in accordance with Section 01 57 13– Temporary Erosion and Sediment Control.

C. Construction Waste Management - Materials and Resources Credit 2.1 and 2.2: Provide submittals as specified in Section 01 74 19 - Construction Waste Management and Disposal.

D. Recycled Content:
1. Materials and Resources Credit 4: Provide the following electronically.
   a. Product data submittals, in accordance with the requirements of Section 01 33 00– Submittal Procedures and as specified in the various specification sections, highlighting recycled content (as defined in Section 01 60 00).
   b. Provide spreadsheet of all materials used on the project highlighting recycled content materials. Include the percentage of post-consumer and pre-consumer recycled content for recycled content materials, the costs of all materials for the project, and calculations demonstrating that sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes a minimum of 20% based on cost of the total value of the materials in the project.
2. Mechanical, electrical and plumbing components and specialty items such as elevators shall not be included in calculations for this credit. Only include Division 3-10 materials permanently install in the project.

E. Regional Materials:
1. Materials and Resources Credit 5: Provide the following electronically.
   a. Product data submittals, in accordance with the requirements of Section 01 33 00 – Submittal Procedures and as specified in the various specification sections, highlighting regional (as defined in Section 01 60 00) materials.
      1) Location of the manufacturer must be verified by a product cut sheet or letter from the manufacturer.
      2) Manufacturer information shall state the location of extraction, harvest or recovery of all components used in the material or product.

b. Provide spreadsheet of all materials used on the project highlighting regional materials. Include the location of the material manufacturer, the distance from the manufacturer to the project site, the costs of all materials for the project, and calculations demonstrating that a minimum of 20% of the building materials based on cost have been extracted, harvested or recovered, as well as manufactured, within 500 air miles of the project.

F. Rapidly Renewable Materials:
1. Materials and Resources Credit 6: Provide the following electronically.
a. Product data submittals, in accordance with the requirements of Section 01 33 00 – Submittal Procedures and as specified in the various specification sections, highlighting rapidly renewable (as defined in Section 01 60 00) materials.
b. Provide spreadsheet of all materials used on the project highlighting rapidly renewable materials. .

G. Low Emitting Materials -
1. Indoor Environmental Quality Credit 4.1: Provide the following electronically.
a. Properly completed Products Form (00 62 33).
b. Provide a cut sheet and / or material safety datasheet (MSDS) for all adhesives used, with VOC levels highlighted. No other information contained on MSDS sheet shall be reviewed.
c. Provide in accordance with Section 01 60 00– Product Requirements.
2. Indoor Environmental Quality Credit 4.2: Provide the following electronically.
a. Properly completed Products Form (00 62 33).
b. Provide a cut sheet and / or material safety datasheet (MSDS) for all coating applied on-site in the building, with VOC levels highlighted. No other information contained on MSDS sheet shall be reviewed.
c. Provide in accordance with Section 01 60 00– Product Requirements.
3. Indoor Environmental Quality Credit 4.3: Provide the following electronically.
a. Properly completed Products Form (00 62 33).
b. Provide a cut sheet and / or material safety datasheet (MSDS) for all carpet systems used in the building, with VOC levels highlighted. No other information contained on MSDS sheet shall be reviewed.
c. Provide in accordance with Section 01 60 00– Product Requirements.
4. Indoor Environmental Quality Credit 4.4: Provide the following electronically.
a. Properly completed Products Form (00 62 33).
b. Provide a cut sheet and / or material safety datasheet (MSDS) for all composite wood products used in the building, with VOC levels highlighted. No other information contained on MSDS sheet shall be reviewed.
c. Provide in accordance with Section 01 60 00 – Product Requirements.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 CONSTRUCTION IAQ MANAGEMENT (LEED EQ Credits No. 3.1 and 3.2)

A. In accordance with plan and requirements specified in Section 01 35 46 – Indoor Air Quality Management.

3.02 CALGreen ENFORCEMENT:

A. CALGreen will be enforced in the same manner as other Building Codes.
1. The construction documents have been through plan check review for compliance with CALGreen.
2. Final inspections by City inspectors for CALGreen criteria will be conducted before Certificate of Occupancy is granted.

END OF SECTION

LEED 2009 for New Construction and Major Renovations

Project Checklist

San Diego fire Station 17

######

Sustainable Sites — Possible Points: 26

Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
		1	Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
2			Credit 4.4	Alternative Transportation—Parking Capacity	2
		1	Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	Credit 5.2	Site Development—Maximize Open Space	1
		1	Credit 6.1	Stormwater Design—Quantity Control	1
		1	Credit 6.2	Stormwater Design—Quality Control	1
1			Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
		1	Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 10

Y	?	N			
Y			Prereq 1	Water Use Reduction—20% Reduction	
2		2	Credit 1	Water Efficient Landscaping	2 to 4
		2	Credit 2	Innovative Wastewater Technologies	2
		4	Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 35

Y	?	N			
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
15		4	Credit 1	Optimize Energy Performance	1 to 19
4		3	Credit 2	On-Site Renewable Energy	1 to 7
		2	Credit 3	Enhanced Commissioning	2
		2	Credit 4	Enhanced Refrigerant Management	2
		3	Credit 5	Measurement and Verification	3
		2	Credit 6	Green Power	2

Materials and Resources — Possible Points: 14

Y	?	N			
Y			Prereq 1	Storage and Collection of Recyclables	
		3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			Credit 2	Construction Waste Management	1 to 2
		2	Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

Y	?	N			
2			Credit 4	Recycled Content	1 to 2
2			Credit 5	Regional Materials	1 to 2
	1		Credit 6	Rapidly Renewable Materials	1
		1	Credit 7	Certified Wood	1

Indoor Environmental Quality — Possible Points: 15

Y	?	N			
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
		1	Credit 1	Outdoor Air Delivery Monitoring	1
1			Credit 2	Increased Ventilation	1
		1	Credit 3.1	Construction IAQ Management Plan—During Construction	1
		1	Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
		1	Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
		1	Credit 7.2	Thermal Comfort—Verification	1
		1	Credit 8.1	Daylight and Views—Daylight	1
		1	Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

	1		Credit 1.1	Innovation in Design: Specific Title	1
	1		Credit 1.2	Innovation in Design: Specific Title	1
	1		Credit 1.3	Innovation in Design: Specific Title	1
	1		Credit 1.4	Innovation in Design: Specific Title	1
	1		Credit 1.5	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

		1	Credit 1.1	Regional Priority: WEc2	1
		1	Credit 1.2	Regional Priority: WEc3	1
1			Credit 1.3	Regional Priority: EAc2	1
		1	Credit 1.4	Regional Priority: IEQc8.1	1

Total — Possible Points: 110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

SECTION 01 91 00

COMMISSIONING

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. The requirements of the General Conditions, Supplementary Conditions, and Division 1 - General Requirements, apply to the work of this Section.

B. The requirements of this section include building commissioning requirements.

C. Coordinate with Plumbing; Heating, Ventilating, and Air Conditioning (HVAC); and Electrical requirements.

1.02 RELATED SECTIONS

A. Division 22 00 00: Plumbing

B. Division 23 00 00: Heating, Ventilating, and Air Conditioning (HVAC)

C. Division 26 00 00: Electrical

1.03 DESCRIPTION

A. Commissioning during the construction phase is a process intended to achieve the following specific objectives:

1. Verify applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted standards and receive adequate operational checkout by installing contractors.

2. Verify and document equipment and systems operate and perform according to the Owner's Project Requirements and the Contract Documents.

3. Verify that the Operations and Maintenance documentation on site conforms to LEED for Green Building Design and Construction 2009 requirements.

4. Verify that the Owner's operating personnel are trained in accordance with LEED for Green Building Design and Construction 2009 and CALGreen 2010 requirements.

B. Deferred or seasonal commissioning may be required if commissioning during the construction phase does not fulfill the objectives listed above.

C. Commissioning augments but does not replace close-out procedures or any other testing requirements contained in the contract documents.

D. Commissioning may continue past substantial completion, until issues of non-compliance have been resolved.

E. Commissioning Schedule

1. Provide schedules for equipment start-up.

2. Incorporate commissioning activities into overall construction master schedule and update as required.

1.04 SYSTEMS TO BE COMMISSIONED

A. This section applies to the following systems
.

1. Heating, Ventilation, Air Conditioning (HVAC) Systems and Controls

2. Indoor Lighting System and Controls

3. Water Heating System

4. Renewable Energy Systems

5. Landscape Irrigation Systems

6. Water Reuse Systems

7. Building Automation System

1.05 COMMISSIONING TEAM

A. The commissioning team includes:

1. The owner, owner's representative (s), facility staff

2. Commissioning authority (CA)

3. Architect and design engineers (A/E)

4. General contractor, manufacturers, vendors (GC)

5. Sub-contractors

1.06 COMMISSIONING TEAM RESPONSIBILITIES

A. Owner, Owner's Representative (s), Facility Staff

1. Define project requirements and develop written Owner's Project Requirements Document

2. Review the commissioning plan and provide feedback

3. Review the Basis of Design Document and provide feedback

4. Attend commissioning meetings as required

5. Review prefunctional checklists and startup plans

6. Review functional performance test procedures

7. Review training plan

B. Commissioning Authority

1. Direct and coordinate commissioning activities

2. Develop and distribute a Commissioning Plan. Final content authority shall remain with the CA. The plan will include:

   a. General Information
      1. Project Name, Owner, Location
      2. Building type, Building area
      3. Project Schedule
      4. Contact Information of individual / company providing the commissioning services

   b. Commissioning Goals
      1. Meeting CALGreen Code requirements for commissioning
      2. Meeting OPR and BOD requirements
      3. Carrying out requirements for commissioning activities as specified in plans and specifications

   c. Systems to be Commissioned
      1. An explanation of the original design intent
      2. Equipment and systems to be tested, including the extent of tests
      3. Functions to be tested
      4. Conditions under which the test shall be performed
      5. Measureable criteria for acceptable performance

   d. Commissioning Team Information

e. Commissioning Process Activities, Schedules, and Responsibilities

3. Develop commissioning specifications for inclusion in the contract documents
4. Review design prior to mid-construction document phase
5. Provide initial schedule of commissioning activities to the General Contractor
6. Plan and conduct commissioning meetings as required
7. Perform site visits, as necessary, to observe equipment and system installations
8. Review contractor submittals
9. Develop and distribute prefunctional checklists
10. Develop and distribute functional performance test procedures
11. Review test and balance report
12. Coordinate, witness, and approve functional performance test procedures
13. Coordinate re-testing as required
14. Verify training plans and training of owner's personnel
15. Provide final commissioning report
16. Complete LEED documentation
17. Revisit facility 8 – 10 months following substantial completion

C. Architect and Design Engineer

1. Review the Owner's Project Requirements document
2. Develop and provide for review the Basis of Design document
3. Integrate commissioning specifications into the construction documents
4. Review the commissioning plan and provide feedback
5. Evaluate commissioning review comments for possible inclusion into the design
6. Perform site visits, as necessary, to observe equipment and system installations

7. Attend commissioning meetings as required
8. Review prefunctional checklists and startup plans
9. Review and approve the test and balance report
10. Review functional performance test procedures
11. Resolve questions relating to system design
12. Review and approve the Operations and Maintenance manuals
13. Participate in the operator training as required

D. General Contractor, Manufacturers, Vendors

1. Include the cost of commissioning in the total contract price
2. Review commissioning plan and provide feedback
3. Integrate commissioning activities into the construction process and master schedule and update as required
4. Facilitate and support the commissioning process. Coordinate commissioning with sub-contractors.
5. Attend commissioning meetings as required and provide commissioning meeting minutes
6. Provide construction submittals, Operations and Maintenance data, and other information to the commissioning authority as requested
7. Review prefunctional checklists and provide completed checklists to the commissioning authority prior to functional performance testing
8. Provide completed point-to-point check out verifications prior to functional performance testing
9. Review test and balance report and provide to the commissioning authority prior to functional performance testing
10. Review functional performance test procedures
11. Participate in the resolution of system deficiencies identified during the commissioning process
12. Prepare Operations & Maintenance manuals

13. Provide Systems Manual documentation as requested by the commissioning authority and as defined in this section

14. Develop training plans as defined in this section

15. Provide as-built drawings including sequences of operation

16. Coordinate any seasonal or deferred testing

E. Sub-Contractor (s)

1. Review and execute prefunctional checklists

2. Review and execute functional performance test procedures under the direction of the commissioning authority

3. Participate in the resolution of system deficiencies identified during the commissioning process

4. Provide training as outlined in the training plans

1.07 DEFINITIONS

A. Commissioning – A quality assurance process beginning in design and continuing through occupancy and beyond. Commissioning verifies new buildings operate as the owner intended and building staff are prepared to operate and maintain its systems and equipment.

B. Owner's Project Requirements (OPR) – A written document detailing the functional requirements of a project and the expectations of how it will be used and operated. These include project goals, measureable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

C. Basis of Design – A document recording the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements and to satisfy applicable regulatory requirements, standards and guidelines. The document includes both narrative descriptions and lists of individual items supporting the design process.

D. Commissioning Plan – A document outlining the organization, schedule, allocation of resources, roles and responsibilities of the commissioning process.

E. Commissioning Authority – The entity leading, planning, scheduling, and coordinating the commissioning process.

F. Prefunctional Checklist – A form used by the contractor and sub-contractors to verify and demonstrate system components are correctly installed and functional.

G. Functional Performance Test Procedure – A step-by-step written protocol defining methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces between systems.

H. Acceptance Criteria – The conditions which must be met for systems / equipment.

I. Deficiency – A condition in the installation or function of a component or system not in compliance with the contract documents, Owner's Project Requirements, or Basis of Design.

J. Issues Log – A formal on-going record of problems or concerns – and their resolution – that have been raised by members of the commissioning team throughout the commissioning process.

K. Systems Manual – A system focused composite document that includes the operations manuals, maintenance manuals, and additional information of use to the owner to allow for the operation of the installed systems.

PART 2 – PRODUCTS

2.01 TEST EQUIPMENT

A. Provide required test equipment, instruments and components for measurements, verifications, and commissioning of systems listed in paragraph 1.04 of this Section.

B. Instruments shall be calibrated in accordance with the National Institute of Standards and Technology (NIST).

C. Any required test equipment shall be included in the based price bid by the Contractor.

PART 3 – EXECUTION

3.01 PREFUNCTIONAL CHECKLISTS AND START-UP PLANS

A. The Commissioning agent (CA) shall develop prefunctional checklists above and beyond the Contractor's start-up forms.

B. The prefunctional checklists shall be provided to the Owner who shall distribute to the Contractor for review and comment. Final content authority shall remain with the CA.

C. The prefunctional checklists do not replace manufacturer start-up forms.

D. Provided to the CA a minimum of three months prior to equipment startup, submittals include but are not limited to:

1. Contractor start-up forms

2. Manufacturer start-up forms

3. Point-to-point checkout verification forms

E. The prefunctional checklists, Contractor start-up forms, controls point-to-point checkout forms, and manufacturer start-up forms shall be combined to form the start-up plans.

F. The Contractor shall insert the start-up plans into clear plastic sheaths and affix them to their respective piece of equipment or maintain the start-up plans in binders accessible to the personnel performing the work.

G. The start-up plans shall be executed by the Contractor who may assign this task to a sub-contractor, vendor, or other party responsible for equipment installation.

H. Only individuals that have direct knowledge of an item in the start-up plans shall initial the item as complete.

I. The CA shall observe the start-up of selected equipment.

J. The contractor shall list items not in conformance with the start-up plans and explain any outstanding items not successfully completed at the bottom of the applicable prefunctional checklist.

K. Within one week after completion of the start-up plan the Contractor shall provide the CA with a signed and dated copy.

L. The responsible party shall correct areas that are deficient or incomplete in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and submit an updated start-up report.

M. Start-up plans shall be repeated, as necessary, until the deficiencies have been corrected.

N. Items left incomplete, which later cause deficiencies or delays during functional performance testing shall result in back charges to the responsible party.

O. The CA shall accept or reject each start-up plan, with one of the following:

1. No Exception Taken

2. Revise, No Resubmission Required

3. Revise and Resubmit

4. Rejected

P. A sampling strategy is not allowed.

3.02 CONTRACTOR SUBMITTALS

A. Submittals applicable to the systems listed in paragraph 1.04 of this Section shall be copied to the CA for review in parallel with the normal distribution / review process. Submittals for commissioned equipment and systems will be reviewed for quality assurance and compliance with the Owner's Project Requirements. Information may include, but is not limited to:

1. Equipment cut sheets
2. Shop drawings
3. Test and Balance Plan
4. Installation manuals and manufacturer startup forms
5. Control drawings and detailed sequences of operation
6. Building automation system points list

B. The CA does not have the authority to approve or reject the submittals, but may provide comment.

C. If the CA does not provide comments, this may not be accepted as a reason for a claim of delay or for a time extension by the Contractor.

3.03 COMMISSIONING MEETINGS

A. The CA shall schedule, plan and conduct a commissioning kickoff meeting.

B. At the discretion of the CA, subsequent commissioning meetings shall be planned and conducted as required. Typically the frequency increases as construction nears completion, at which time meetings may be held as frequently as on per week.

C. Whenever possible the meetings shall be held in conjunction with, prior to, or following other team meetings.

D. The meetings shall cover commissioning coordination and deficiency resolution.

E. The meetings shall be held at the Contractor's site office or other on-site location agreed to between the Owner, Commissioning Agent, and Contractor.

F. As required the following may be requested to attend:

1. Contractor's site superintendent

2. Mechanical and electrical sub-contractors

3. Other parties involved in Work.

G. Contractor's representatives shall be qualified and authorized to act on behalf of party each represents.

H. The Contractor shall record meeting minutes and distribute copies to attendees within three (3) working days after meeting.

3.04 FUNCTIONAL PERFORMANCE TESTING

A. Objectives and Scope

1. The objective of functional performance testing is to demonstrate each system is operating according to the Owner's Project Requirements and contract documents.

2. Functional performance testing facilitates bringing the systems from a state of substantial completion to full dynamic operation.

3. During the testing process, areas of deficient performance are identified and corrected.

4. Each system to be commissioned shall be operated through its modes of operation (e.g. occupied, unoccupied, warm-up, cool-down, part-load, etc.). Proper responses to conditions such as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

B. Development of Test Procedures

1. Before test procedures are developed the CA shall be provided with requested documentation and a current list of change orders affecting equipment or systems, including but not limited to an updated points list, control sequences of operation, program code, and operating parameters.

2. The CA shall develop test procedures to verify and document proper operation of each piece of equipment and system.

3. Prior to the execution of the test procedures, the Contractor and A/E team shall review and comment on the test procedures. Final content authority shall remain with the CA.

4. The test procedure forms shall include, but not be limited to the following information:

   a. Date and Party

   b. Signature Block

   c. Prerequisites

   d. Precautions

   e. Instrumentation

f. Reference

g. Test Instructions

h. Acceptance Criteria

i. Results

j. Return to Normal

k. Deficiencies

C. General Functional Test Methods

1. Functional testing shall be achieved by manual testing and by monitoring the system performance and analyzing the results using the building automation system's trend log capabilities.

2. Functional testing sequence

a. Functional testing shall not be conducted until after the start-up plans have been accepted by the CA.

b. Functional testing shall not be conducted until after the air and water balancing is completed and approved.

c. Functional testing proceeds from components to subsystems to systems. When proper performance of interacting systems has been achieved, the interface or coordinated responses between the systems shall also be verified.

3. Functional Test Setup

a. Each functional test shall be performed under conditions that simulate actual conditions as close as is practically possible.

b. The sub-contractor executing the test shall provide necessary materials, system modifications, etc. to produce flows, pressures, temperatures, etc. necessary to execute the test according the specified conditions.

c. At the completion of the test the sub-contractor shall return affected building equipment and systems to their pre-test condition.

4. Functional Test Sampling

a. At the discretion of the CA multiple identical pieces of non-critical equipment may be functionally tested using a sampling strategy.

b. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference.

D. Coordination and Scheduling

1. The Contractor shall incorporate commissioning items into the construction master schedule.

2. The CA shall schedule functional performance testing through owner, who shall in turn coordinate with the Contractor. The CA may coordinate directly with the Contractor with the approval of the owner.

3. The CA shall direct, witness, and document the functional performance testing.

4. The Contractor and sub-contractors shall execute the test procedures as directed.

E. Control Signal Manipulation

1. Actual Conditions: Testing system and equipment to experience actual operating conditions and legitimate control signals is preferred, although it will not be feasible that the system to be commissioned will experience the full range of operating conditions within the testing period.

2. Simulated Conditions: Simulating conditions shall be used as necessary in order to test the systems in different operating conditions.

3. Overwritten Values: Overwriting sensor values to simulate a condition shall be at the discretion of the CA.

F. Simulated Signals: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is acceptable.

1. Altering Setpoints: Altering system setpoints is acceptable and shall be employed as necessary.

G. The CA may recommend solutions to issues, however the burden of responsibility to solve, correct, and retest problems is with the Contractor, sub-contractors, and A/E.

3.05 DEFERRED AND SEASONAL TESTING

A. Unforeseen Deferred tests

1. If a check or test cannot be completed due to the building structure, required occupancy condition, or other situation, execution of the start-up plans or functional performance testing may be delayed upon approval of the owner.

2. The tests shall be conducted as soon as possible.

3. Services of necessary parties shall be negotiated.

B. Seasonal Testing

1. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design conditions) shall be completed as part of this contract.

2. The CA shall coordinate this activity through the owner.

3. Tests shall be executed and deficiencies corrected by the appropriate sub-contractors, with the owner's operator (s) and the CA witnessing, directing and documenting. Final adjustments to the Operation and Maintenance Manuals and as-built drawings due to the testing shall be made by the Contractor.

3.06 NON COMPLIANCE

A. The CA shall document the results of the functional performance testing on the procedure or test form. Deficiencies or non-compliance issues shall be noted and reported to the owner and Contractor.

B. Corrections of minor deficiencies shall be made during the tests at the discretion of the CA. In such cases the deficiency and resolution shall be documented on the procedure form.

C. Where there is no dispute on the non-compliance issue and the sub-contractor accepts responsibility to correct it.

1. The CA documents the deficiency, remediation and the sub-contractor's intention to correct the deficiency and continues with the functional performance test, if possible, or executes another functional performance test or procedure.

2. The portions of the functional performance test procedure determined to be in non-compliance shall be repeated when the Contractor indicates the issue has been corrected.

D. If there is a dispute about a non-compliance issue, regarding if it is in fact a deficiency, the party responsible for correction, or the appropriate correction:

1. The deficiency shall be documented by the CA along with the sub-contractor's response and provided to the owner and Contactor.

2. Resolutions shall be made at the lowest possible management level. Additional parties may be involved if required. Final design interpretive authority is with the A/E. Final acceptance authority is with the owner.

3. The resolution process shall be documented by the CA.

4. If the final interpretation is an issue requiring resolution exists, the portions of the functional performance test procedure originally determined to be in non-compliance shall be repeated when the Contractor indicates the issue has been corrected.

E. The cost for a sub-contractor to repeat a prefunctional checklist or functional performance test, if they are responsible for the deficiency shall be theirs.

F. For an identified deficiency that is not related to a prefunctional checklist or start-up fault, the following is applicable:

1. The CA shall direct the retesting of the equipment once at no charge to the Contractor.

2. If additional testing is required, the costs shall be charged to the Contractor.

G. The time for the CA to direct retesting as a result of a prefunctional checklist item reported to have been successfully completed, but determined during functional testing to be faulty, shall be charged to the Contractor.

H. Retesting shall not be accepted as a reason for a claim of delay or for a time extension by the Contractor.

I. The CA may assist with deficiency resolution, however final responsibility for resolving identified deficiencies lies with the Contractor.

3.07 SYSTEMS MANUAL

A. In accordance with LEED Reference Guide for Green Building Design and Construction 2009 Edition and CALGreen Section 5.410.2.5.1 Systems Manual, the Contractor shall provide the following documentation for each equipment type and/or system listed in paragraph 1.04 of this Section for inclusion in the Systems Manual.

1. Record as-built drawings and documents (including single-line diagrams)

2. Final as-built control drawings and schematics

3. Final as-built control sequences of operation
4. Construction documents – Location or delivery information
    a. Mechanical and electrical drawings
    b. Specifications
    c. Submittals
    d. Project change orders and information
5. Current requirements
    a. Building operating schedules
    b. Space temperature, humidity and pressure, CO_2 setpoints
    c. Summer and winter setback schedules
    d. Chilled and hot water temperatures
    e. As-built control setpoints and parameters
6. Site contact information
    a. Owner information
    b. Emergency contacts
    c. Design team; architect, mechanical engineer, electrical engineer, etc.
    d. Prime contractor contact information
    e. Sub-contractor information
    f. Equipment supplier contact information
7. Basic operation and maintenance, including general site operating procedures, basic trouble shooting, recommended maintenance requirements, site events log
    a. Basic Operation
        1. Written narratives of basic equipment operation

2. Operating instructions for integrated building systems including Interfaces, interlocks, and interaction with other equipment and systems
3. Initial maintenance provided by Contractor

b. General Site Operating Instructions

1. Instructions for changes in major system operating schedules
2. Instructions for changes in major system holiday and weekend schedules

c. Basic Trouble Shooting

1. Cite any recommended troubleshooting procedures specific to the major systems and equipment installed in the building
2. Manual operation procedures
3. Bypass operation procedures
4. Major system power fail resets and restarts
5. Trend log listing

d. Recommended Maintenance Events Log

1. HVAC air filter replacement schedule and log
2. Building control system sensor calibration schedule and log
3. Recommended schedule of maintenance requirements and frequency, if not already included in the Project O&M manuals

e. Operation and Maintenance Manuals – location or delivery information

8. Major Systems

a. HVAC Systems and Controls

1. Air conditioning equipment (chillers, cooling towers, pumps, heat exchangers, thermal energy storage tanks, etc.)
2. Heating equipment (boilers, pumps, tanks, heat exchangers, etc.)
3. Air distribution equipment (fans, terminal units, accessories, etc.)
4. Ventilation equipment (fans, accessories, and controls)
5. Building automation system (workstation, servers, panels, variable frequency drives, local control devices, sensors, actuators, thermostats, etc.)

b. Indoor Lighting Systems and Controls

1. Lighting control panels
2. Occupancy sensors
3. Daylight harvesting systems

c. Renewable Energy Systems

1. Photovoltaic panels and inverters
2. Wind powered electrical generators and inverters

d. Landscape Irrigation Systems

1. Water distribution diagrams
2. Control system

e. Water Reuse Systems

1. Reclaimed water system for indoor use
2. Reclaimed water for irrigation use

9. Site Equipment Inventory and Maintenance Notes

a. Spare parts inventory

b. Frequently required parts and supplies

c. Special equipment required to operate or maintain systems

d. Special tools required to operate or maintain systems

e. A copy of special inspection verifications required by the enforcing agency of this code

f. Other resources and documentation

3.08 SYSTEMS OPERATION TRAINING

A. In accordance with CALGreen Section 5.410.2.5.2 Systems Operation Training, the Contractor shall develop a written training plan and provide training to the appropriate facility staff for each equipment type and/or system listed in paragraph 1.04 of this Section.

B. The written training plan includes:

1. Learning goals and objectives for each session

2. Training agenda, topics, and length of instruction for each class session

3. Instructor information and qualifications

4. Location of training sessions (onsite, off-site, manufacturer's or vendor's facility

5. Attendance forms

6. Training materials

7. Description on how the training will be archived for future use

C. For each system the following shall be included:

1. Systems / Equipment Overview

   a. Review Owner's Project Requirements and Basis of Design related to the major systems and equipment

   b. Describe system type and configuration

   c. Explain operation of all major systems and equipment and how it interfaces with other systems and equipment

   d. Describe operation of control system for each system, location of critical control elements, and procedures to properly operate control system

   e. Review recommendations for implementation to reduce energy use and water use

2. Review and Demonstration of Service / Preventative Maintenance

   a. Explain location or delivery contact of the Operation and Maintenance manuals

   b. Review of manufacturer's recommended maintenance activities to maintain warranty

   c. Review and demonstrate frequent maintenance activities (air filter replacement, lubrication, fan belt inspection, and / or replacement, condenser water treatment, etc.), and suggested schedule

   d. Review and demonstrate typical servicing procedures and techniques (electrical current, pressure, and flow readings, etc.; calibration procedures, point trending, power fail restart procedures, etc.)

   e. Located, observe and identify major equipment, systems, accessories and controls

   f. Review emergency shut-offs and procedures

3. Review of the Information in the Systems Manual

   a. Describe use of Systems Manual

   b. Review elements of Systems Manual

c. Explain how to update and add revisions to Systems Manual

4. Review Record Drawings on the Systems / Equipment

a. Explain location or delivery contact of the record drawings

b. Review record drawings, revisions, and changes to original design drawings

c. Review equipment schedules and compare with actual installed systems

3.09 ACCEPTANCE PROCESS

A. Process for Owner's Acceptance of Work:

1. Fulfillment of prerequisites to Acceptance.

2. Inspection for Acceptance.

3. Issuance of Letter of Acceptance.

3.10 PARTIAL ACCEPTANCE OF WORK

A. When partial utilization of Work is required and Acceptance of Work is a condition of such partial utilization, applicable requirements specified in this Section shall apply to parts of Work to be utilized.

3.11 PREREQUISITES TO ACCEPTANCE

A. Following to be completed prior to requesting Owner's inspection for Acceptance.

B. Perform Contractor Start-Up Activities.

1. Submit evidence of compliance with regulatory requirements, including:

a. Occupancy permits.

b. Inspection / operating certificates.

2. Remove from project site temporary facilities, tools, equipment, mock-ups and similar items.

3. Complete starting of systems and equipment.

4. Complete testing, adjusting and balancing of systems and equipment.

5. Complete functional performance testing, including deficiency resolution.

6. Complete final cleaning.

7. Submit project record documents.

8. Submit operation and maintenance materials.

9. Submit training plans.

10. Provide spare parts and maintenance materials.

11. Submit product warranties and certificates of assurance.

12. Make final changeover of locks and transmit keys to Owner.

13. Ensure Work is ready for use for purpose intended.

3.12 INSPECTION FOR ACCEPTANCE

A. Submit written request to Owner for inspection for Acceptance of Work, certifying prerequisites have been satisfied and indicating any exceptions to be completed, corrected or submitted.

B. Owner shall, within a reasonable time after receipt of the inspection request, proceed with the inspection, or inform the Contractor of any prerequisites not completed.

C. Results of Owner's inspection for Acceptance shall form an initial Contract deficiency list.

3.13 ACCEPTANCE OF WORK

A. Following inspection, Owner shall:

1. Issue a Letter of Acceptance stating effective date of Acceptance of Work, with a copy of Contract Deficiency list attached, or

2. Advise Contractor that prerequisites to Acceptance are not fulfilled and repeat inspection for Acceptance after the perquisites have been addressed.

B. Upon Issuance of Letter of Acceptance, Owner shall assume responsibility for care, custody and control of Work, including responsibility for:

1. Facility operation, including systems and equipment.

2. Maintenance.

3. Security.

4. Property insurance.

5. Utility costs.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Demolition necessary or required so that the new construction and related work can be performed and completed in accordance with the Contract Documents.
   1. Debris (demolition materials) shall be salvaged, recycled or otherwise diverted from landfill. Debris which cannot be salvaged, recycled or used on-site for fill shall be removed from site and disposed of in a legal manner.
   2. Existing equipment and fixtures that are not specifically noted on Drawings will not be salvaged and these items shall become the property of the Contractor and removed from site.
   3. Concrete and brick from demolished existing buildings to be used for fill and paving aggregates or otherwise diverted from landfill.

B. Related Sections:
   1. Section 01 74 19 – Construction Waste Management and Disposal: Required record keeping and other LEED requirements.
   2. Section 31200 – Earthwork for Structures and Pavements

1.02 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00:
   1. Copies of permits and notices authorizing building demolition as may be required by law, including permits to transport and dispose of debris.
   2. Shop Drawings: Drawings of temporary structural support locations and calculations sealed by a Structural Engineer registered in the State where the project is located.
   3. Demolition Plan: Submit detailed plan outlining specifics of techniques to be employed for demolition, protection of adjoining building and items which will not be able to be diverted from landfill.
   4. Insurance: Submit proof of insurance as required by SSP Section 7-3 in Volume 1.
   5. Submit documentation acceptable to LEED Project Administrator showing total weight(s) of concrete / brick diverted from landfill as required for LEED submittals.

B. Submit project record documents which accurately record actual locations of capped utilities, and concealed obstructions in accordance with Section 01 77 00.

1.03 QUALITY ASSURANCE

A. Demolition Firm Qualifications:
   1. Specializing in performing the Work required by this Section and as indicated on Demolition Drawings.
   2. Minimum 2 years documented experience.
   3. Utilizing workers experienced in disconnecting and capping utilities, if applicable.

B. Regulatory Requirements
1. Conform to applicable code(s) for demolition of structures, safety of adjacent structures, dust control, runoff control and disposal.
2. Obtain required permits from authorities.
3. Notify Resident Engineer immediately if hazardous or contaminated materials are discovered.

1.05 SEQUENCING AND COORDINATION

A. Sequence activities to demolish the work in accordance with the Contractor's Project Schedule.

B. Contractor shall coordinate full demolition requirements with improvement documents, including that demolition which may include public right of way, to accommodate all new improvements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Carefully remove salvageable items such as light fixtures, grilles, doors, hardware, plumbing fixtures, and other items which are not specifically indicated for reuse, but which may have salvage value.
1. Remove materials and equipment as noted on Demolition drawings that Owner will salvage prior to demolition.
2. Materials and equipment which are not salvaged by the Owner shall become the possession of the Contractor and shall be immediately removed from the site in accordance with Construction Waste Management Plan as provided in Section 01 74 19.

B. Carefully remove materials (in whole or in part as required) that are scheduled for reuse. Store and protect for reinstallation the materials.
1. Concrete: Crushed and graded concrete may be used as aggregate, sub-base material, or fill.
2. Asphalt Material: Sort by type. May be recycled for asphalt paving products or used as fill off site.
4. Wood: Sort by type and size for salvage. Wood unsuitable for salvage shall be properly disposed of
5. Metal: Salvage metals for recycling.

C. Fill materials at excavations: As specified in Section 31200.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and notify the Resident Engineer in writing of discrepancies before proceeding with the work.

B. When unanticipated mechanical, electrical, or structural elements that conflict with the intended demolition are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Resident Engineer.

3.02 PREPARATION

A. Notify affected utility companies before starting work and comply with their requirements.
   1. Mark location of utilities.
   2. Identify, disconnect, remove and cap designated utilities within demolition areas.

B. Provide, erect, and maintain temporary barriers and security devices where required and as indicated on drawings.

C. Protect bench marks and existing work from damage or displacement.

D. Prevent movement or settlement of adjacent structures.

E. Protection of existing building exterior. Erect barriers as indicated and as otherwise required to protect adjacent buildings and site amenities. Maintain exit requirements.

F. Roofing Removal: During the removal of the existing parapets and roofing, provide proper protection from falling objects.

3.03 GENERAL DEMOLITION

A. Carry out demolition work to cause as little inconvenience to any adjacent occupied building or site areas as possible and with minimum interference to public or private accesses. Maintain protected egress and access at all times.

B. Shore existing construction as required to maintain safe working environment.

C. Cease operations immediately if adjacent structures appear to be in danger. Notify authority having jurisdiction and Resident Engineer. Do not resume operations until directed by Resident Engineer.

D. Provide hoses and water connections for sprinkling of debris as necessary to limit dust to lowest practicable level.

E. Material Disposal: In accordance with Section 01 74 19 and as follows.
   1. Remove materials from site and dispose of in accordance with the Waste Management Plan.
   2. No materials are to be sold on, or adjacent to, the site.
   3. Burning of materials on site is not permitted.
   5. Remove from site, contaminated, vermin infested, or dangerous materials encountered and dispose of by safe means so as not to endanger health of workers and public.
   6. Debris from the demolition shall not be allowed to accumulate within the building or on the site.

END OF SECTION

SECTION 03 05 05

FLY ASH

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Fly ash admixture for incorporation into concrete mixes specified in the following specification sections:
   1. Section 03 30 00 - Cast-In Place Concrete.
   2. Section 04 05 15 - Mortar and Masonry Grout.
   3. Section 04 22 00 - Concrete Masonry Units.
   4. Section 32 51 40 – Portland Cement Paving
   5. Section 32 62 00 – Concrete Curbs

1.02 SUBMITTALS

A. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Qualifications: The specific personnel to be involved in the finishing of concrete slabs shall demonstrate prior experience with mixes containing this elevated level of fly ash.

B. Mockups: A test slab shall be poured prior to installing the actual building slab to demonstrate finish which will be achieved with fly ash concrete at the percentage to be provided for this project.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
   1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
   2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Coal Fly Ash and Raw or Calcined Natural Pozzolan
   1. Sampled and tested in accordance with the current edition of ASTM C 311, Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete.
   2. Conform to the requirements of the current edition of ASTM C 618, Standard Specification of Coal Fly Ash and Raw and Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete, as follows:
      a. Meet the requirements of ASTM C 618, Table 1 Chemical Requirements and Table 1A Supplementary Optional Chemical Requirements.

b. Meet the requirements of ASTM C 618, Table 2 Physical Requirements and Table 2A Supplementary Optional Physical Requirements in the following areas:
   1) Effectiveness in Controlling Alkali-Silica Reaction.
   2) Effectiveness in Contributing to Sulfate Resistance, Procedure A.
   3) Uniformity Requirements when air-entraining concrete is specified:

c. Air-entrained concrete is not recommended in locations at elevations below 3000 ft. above sea level.

3. Source Quality Control:
   a. Fly ash shall come from sources with an established quality control program to demonstrate that the fly ash consistently conforms to ASTM C 618 specification and uniformity requirements. The quality history shall include a minimum of 40 test results representing a minimum of the previous 6 months production of fly ash.
   b. Per the current edition of ACI 232, Use of Fly Ash in Concrete, section 5.6, the fly ash quality history shall be available that demonstrates at least monthly ASTM C 618 certification results from a Cement and Concrete Reference Laboratory (CCRL) accredited laboratory. A minimum of 20 reports representing at least 6 months of fly ash production is required.

2.02 MIXES

A. Provide fly ash admixture for incorporation into concrete mixes as specified in the following specification sections:
   1. Section 03 30 00 - Cast-In Place Concrete.
   2. Section 04 05 15 - Mortar and Masonry Grout.
   3. Section 04 22 00 - Concrete Masonry Units.
   4. Section 32 51 40 – Portland Cement Paving
   5. Section 32 62 00 – Concrete Curbs

B. Proportioning:
   1. Per ACI 232, Use of Fly Ash in Concrete, section 4.1, the most effective method for proper proportioning of concrete for a specific application is by use of a trial batch and testing program per ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete. When necessary, a series of mixtures shall be prepared and tested to determine the proper proportions for the specific project requirements.
   2. Fly ash proportioning to be provided by mass of total cementitious material.
   3. Not more than 15% of cementitious materials with a replacement factor of 1:2 relative to cement replaced.
   4. Fly ash level may be increased beyond the allowable 15% to not more than 40% for footings and 25% for concrete slabs that will receive either a broom finish or epoxy coating, but in such cases ACI provisions for determining standard deviation using test results for similar mixes is disallowed.
      a. For any mix in which fly ash content exceeds 15%, standard deviation shall be calculated using test results for the exact mix to be used on this Project.
      b. Smooth/trowelled finishes should not have this level of fly ash due to finishing issues.
   5. Contractor shall note that fly ash will cause the curing to specified strengths to take additional time (40 to 50 days instead of 28). Verify implications with Resident Engineer and Structural Engineer regarding backfilling and retaining walls.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 03 10 00

CONCRETE FORMING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Formwork for cast-in-place concrete, including, but not limited to:
1. Shoring, Bracing and Anchorage, including openings for other Work
2. Form Accessories
3. Form Stripping.

B. Work performed under this section shall also comply with the requirements of the Structural Notes on the structural drawings.

1.02 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.03 SUBMITTALS

A. Shop Drawings: Submit Drawings showing dimensions, materials, bracing, tie-hole layouts for exposed tie holes, and arrangement of joints.

B. Product Data: Provide data on accessory materials and installation requirements.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347R - Guide to Formwork for Concrete.

1.05 QUALIFICATIONS

A. Design formwork under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the place where the Project is located.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site to prevent deterioration and damage.

B. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.07 COORDINATION

A. Coordinate this Section with other Sections of Work which require attachment of components to formwork.

B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from Resident Engineer before proceeding.

PART 2 PRODUCTS

2.01 MATERIALS - GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

2.02 FORM MATERIALS

A. Metal Formwork and Accessories: In accordance with ACI 301. Provide as large a face dimension as possible for each individual form. Metal formwork shall be provided for all concrete formwork unless "special" shapes and sizes are required.

B. Wood Materials:
1. Plywood: Douglas Fir species; APA grade-trademarked; BB Plyform, Class 1, Exterior Grade as per PS1.
2. Lumber: Spruce, Pine or Fir species; construction grade; with grade stamp clearly visible.

2.03 FORMWORK ACCESSORIES

A. Form Ties: Removable or snap-off type, free of defects that could leave holes larger than one inch in concrete surface.

B. Form Release Agent: Colorless, which will not stain concrete, or impair natural bonding or color characteristics of coating intended for use on concrete
1. General Requirements:
a. Vegetable-based, do not use petroleum-based agents. Paraffin and waxes shall not be used when a concrete finish is required.
b. 100 percent biodegradable, zero VOC.
2. Acceptable Products and Manufacturers:
a. Enviroform as manufactured by Conspec® Marketing and Mfg. Co., Inc., Kansas City, KS (800) 348-7351, www.conspecmkt.com
b. Bio-Form as manufactured by Leahy-Wolf Company, Franklin Park, IL (888) 873-5327
c. Greenplus Form Release Agent ES as manufactured by M.J. Doud, Inc., Ennis, MT (888) 682-6040.
d. Soy Form Away as manufactured by Natural Soy, LLC, Watkins, IA (888) 655-0039, www.soysolv.com.
e. Bio-Guard as manufactured by Atlas Construction Supply, Inc., San Diego, CA 92111 (868) 277-2100. www.atlasform.com
f. Or equal.

C. Flashing Reglets: Galvanized steel 22 gage thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

3.02 EARTH FORMS

A. Hand trim sides and bottom of earth forms. Remove loose soil in pour cavity prior to placing concrete.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval from Resident Engineer before framing openings in structural members which are not indicated on Drawings.

F. Provide chamfer strips on external corners of beams and columns.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with Manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive applied coverings which are effected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in or passing through concrete work.

B. Locate and set in place items which will be cast directly into concrete.

C. Coordinate Work of other Sections in forming and placing openings, slots, reglets, recesses, chases, sleeves, bolts, anchors, and other inserts.

D. Install accessories in accordance with Manufacturer's instructions, straight, level and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

A. Clean and remove foreign matter within forms as erection proceeds.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

3.08 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that Work is in accordance with formwork design, and that support, fastenings, wedges, ties and items are secure.

B. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads. Forms shall be removed in accordance with the requirements of the General Structural Notes.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Forms for retaining walls shall not be removed or disturbed for at least 14 days from date of last pouring. It may be required that such forms be left in place longer than the above specified period. The length of time they shall remain in place will depend on the system of forming and shoring, and the length of time shall in accordance with the requirements of the General Structural Notes.

E. 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.

F. Cure exposed concrete in accordance with Section 03 30 00 whenever the formwork is removed during the curing period.

G. Construction Waste: In accordance with Section 01 74 19 .

3.10 REMOVAL STRENGTH

A. When formwork removal is based on the concrete reaching its specified 28 day strength (or a specified percentage thereof), the concrete shall be presumed to have strength when either of the following conditions has been met:

1. When test cylinders, field cured under the most unfavorable conditions prevailing for any portion of the concrete represented, have reached the required strength.
2. When the concrete has been cured for the same length of time as the age, at test, of laboratory cured cylinders which reach the required strength. The length of time concrete has been cured in the field shall be determined by the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air in contact with the concrete is above 50 degrees F. and the concrete has been damp or thoroughly sealed from evaporation and loss of moisture.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Concrete reinforcement as shown on the Drawings and as specified.

B. Work performed under this section shall also comply with the requirements of the Structural Notes on the structural drawings.

1.02 QUALITY ASSURANCE

A. Comply with ACI-301, Chapter 5, except where more exacting requirements are specified.

B. Comply with requirements in AWS-D12.1, except where more exacting requirements are specified in the Contract Documents.

1.03 SUBMITTALS

A. Shop Drawings: Submit Drawings showing bending and placing of reinforcing. Include diagrammatic elevations of walls at a scale sufficiently large to show clearly the position and erection marks of marginal bars and their dowels and splices and bar arrangement for more than one layer of reinforcing steel in concrete sections.

B. Certificates: Submit certified mill test reports for review prior to fabrication.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.04 DELIVERY, STORAGE AND HANDLING

A. Shipping: Deliver reinforcement to the Project site bundled, tagged and marked to facilitate sorting and placing. Tags shall indicate bar sizes, lengths, grade and other information corresponding to markings shown on placement diagrams.

B. Storage and Protection: Store reinforcement at the site off the ground and in a manner to prevent damage to the materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Reinforcing Steel: In accordance with Cast-in-Place Concrete Notes on the structural drawings.

C. Welded Wire Fabric: In accordance with structural drawings.

D. Chairs: Galvanized steel or plastic tipped.

E. Tie Wire: ASTM A82, 16 gauge or heavier, black annealed.

F. Welding Rods: E-70 Series for A615 Grade 40 (ASTM A615M, Grade 300) reinforcing, and E-90 Series for A706 reinforcing; low hydrogen conforming to AWS A-5.1.

2.02 FABRICATION

A. Shop fabricate bars as far as is practical. Bend bars cold. Make bends for stirrups and ties around pins having diameters at least 2 times the thickness of the bars; for other bars 1 inch diameter and smaller, 6 times the thickness; for larger bars 8 times the thickness.

PART 3 EXECUTION

3.01 EXAMINATION

A. Determine weldability of reinforcing steel by laboratory chemical analysis of steel. Only steel conforming to chemical requirements specified in AWS D12.1 may be welded.

3.02 PLACING REINFORCEMENT

A. General:
1. Place in accordance with ACI 318 and as shown on Structural Drawings.
2. Accurately place reinforcement and securely tie at intersections with 16 gauge black annealed wire.
3. Maintain reinforcing in proper position by chairs, bar supports or other approved devices.
4. Bars in footings shall be supported on precast concrete blocks.
5. The bending or field cutting of bars around openings or sleeves will not be permitted.

B. Bars shall lap in accordance with requirements indicated on the structural drawings.

C. Concrete protection of reinforcing shall be in accordance with Cast-in-Place Concrete Notes on the structural drawings.

D. Clear distance between bars shall be not less than 1-1/2 times the maximum size of coarse aggregate unless noted otherwise.

E. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits or embedded items. If bars are moved more than one bar diameter or enough to exceed code tolerances, resulting arrangement of bars shall be subject to review of Resident Engineer.

F. Bars with kinks or bends not indicated shall not be used. Reinforcement shall not be bent or be straightened in a manner that will weaken the material, or be bent after being partially embedded in hardened concrete.

G. Wire mesh in slabs:
1. Lap welded wire fabric at least 1-1/2 meshes plus end extension of wires but not less than 12 inches in structural slabs.
2. Lap fabric at least 1/2 mesh plus end extension of wires but not less than 6 inches in slabs on ground.
3. Extend mesh across supporting beams and walls.

3.03 CLEANING

A. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of off premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Cast-in-place concrete including, but not limited to, the following:
1. Building foundations and slabs on grade.
2. Lightweight concrete floor topping over metal deck at 2nd and 3rd floor and roof
3. Concrete fill for metal pan steel stairs as specified in Section 05 51 00.
4. Site structures including, but not limited to, site lighting supports, electrical and mechanical equipment support pads, and other site furnishing and equipment requiring cast-in-place concrete items.

B. Related Sections:
1. Section 03 10 00 – Concrete Formwork
2. Section 03 20 00 – Concrete Reinforcement
3. Section 07 26 53 – Vapor Reduction Floor Coatings
4. Section 32 51 40 – Portland Cement Paving
5. Section 32 62 00 – Concrete Curbs

1.02 SYSTEM DESCRIPTION

A. Performance Requirements: Interior slabs on grade scheduled to receive applied floor finishes (VCT, carpet, etc.) shall be tested as specified herein under Field Quality Control Calcium chloride test requirements. Moisture vapor from the floor must be less than 3 pounds per 1,000 square feet per 24 hours. Floor slabs that exceed this requirement shall be treated with a Vapor Reduction Floor Coating as specified in Section 07 26 53 as required to provide a satisfactory substrate for applied floor finish at no additional cost to Owner.

1.03 SUBMITTALS

A. Mix Design: Submit mix design for each class of concrete to the Resident Engineer for review. Review of mix designs by Resident Engineer shall in no way relieve the Contractor of responsibility for the performance of the concrete.

B. Product Data: Submit Manufacturer's Specifications and performance data for accessory products.

C. Shop Drawings: Submit shop drawing showing proposed location of construction joints, expansion/contraction joints and control joints and obtain approval of same from Resident Engineer prior to construction.

D. Samples: Submit 4 inch long samples of expansion/contraction joint and control joint.

E. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.04 QUALITY ASSURANCE

A. Standards:
1. Standard for measuring, mixing, transporting and placing of concrete shall be ACI-301 and ACI-304.
2. Standard for measuring, mixing and delivery of ready mixed shall be ASTM C94, except that time in mixer after water has been added at batch plant is limited to 1-1/2 hours.
3. Job-mixed concrete shall be subject to Resident Engineer's review of design, mixing and handling procedures.

B. Field Samples:
1. Provide on-site sample(s) of each type of exposed flatwork concrete finishes (hard trowel, broom finish, sandblast, etc.) including tooling showing texture and color before proceeding with finish to be used on this Project.
2. Sample(s) shall be minimum 4'-0" square and have at least one longitudinal and one transverse joint.
3. Construct sample panels in ample time to allow for finishing and curing before requesting Resident Engineer to review.
4. Construct where directed by Resident Engineer and prepare successive sample panels as required until finish acceptable to Resident Engineer is produced.
5. Since sample panels will constitute a basis of acceptance or rejection of the completed Work, do not remove sample panels until authorized in writing by the Resident Engineer. Dispose of sample panels in a legal manner when authorized.

1.05 PROJECT CONDITIONS

A. Rain protection: Do not place concrete during rain unless adequate protection has been provided.

B. Cold weather protection: Comply with ACI-306R.

C. Hot weather protection: Comply with ACI-305R.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Portland Cement: ASTM C150, Type II, provide type V at locations in contact with soil, alkali content not to exceed 0.6 percent. Use one brand and type of cement throughout Project unless otherwise specified.

C. Aggregate: In accordance with Cast-in-Place Concrete Notes on the structural drawings and as follows.
1. Structural Concrete: Clean, coarse aggregate and gravel, free from foreign matter, conforming to ASTM C33. Aggregate shall be graded from coarse to fine in accordance with ASTM C33, Size 67. See also Structural Notes.

2. Aggregate for lightweight structural concrete: ASTM C 330 except use only shale, slate or clay prepared in a rotary kiln. Test results from an acceptable testing laboratory shall show compliance with the performance requirements of this Specification. Soundness shall have a maximum 15% loss when tested in accordance with ASTM C 88. Absorption shall have a maximum 15% when tested in accordance with ASTM C 127.

D. Admixtures:
1. Air entraining admixture: ASTM C260.
2. Use of calcium chloride is not permitted.
3. Fly ash admixture: In accordance with Section 03 05 05.
4. Use set-retarding admixtures during hot weather only when approved by Resident Engineer.

E. Water: Potable.

2.02 ACCESSORIES

A. Bonding Agent:
1. Interior Only (PVA): L&M Construction Chemicals EVERWELD www.lmcc.com, US Spec "Bondcoat" www.usspec.com, or Larsens' Weld Crete www.larsenproducts.com
2. Interior Only for Bonding Existing Concrete to Fresh Concrete (Epoxy): Sika Sikadur 32, Hi-Mod www.sikausa.com, US spec Maxi-Bond 2500 www.usspec.com,, or W.R. Meadows Rezi-Weld www.wrmeadows.com.
3. Exterior and Interior (acrylic latex): Euclid Eucobond www.euclidchemical.com, W.R. Meadows Intralok www.wrmeadows.com, US Spec Acylcoat www.usspec.com, or Dayton Bond J40 www.daytonsuperiorchemical.com.

B. Non-Shrink Grout:
1. Premixed or prepackaged, non-metallic, non-gaseous, bleed free compound; non-shrink when tested in accordance with ASTM C 1107, Grade B at a fluid (flow cone) consistency of 20 to 30 seconds.
2. Attain minimum compressive strength of 7,000 psi in 28 days at above fluid consistency.
3. Fluid grouts: Remain workable, flow through flow cone after 20 minutes with slight agitation, in temperatures from 40 to 90 degrees F.
4. Acceptable manufacturer and products: Dayton Superior (Suregrip High Performance) www.daytonsuperiorchemical.com, Sika (Sikagrout 212) www.sikausa.com, Master Builders (Masterflow 713) www.masterbuilders.com, W.R. Meadows No. 588 Grout www.wrmeadows.com, L&M Construction Chemicals (DURAGROUT) www.lmcc.com, US Spec "MP Grout" www.usspec.com, and Euclid N-S Grout www.euclidchemical.com or equal.

C. Formed Construction Joint: Standard design plastikey, tongue and groove key joint; 3-1/2 inch vertical dimension for 4 inch slabs.

D. Preformed Expansion Joint Filler: ASTM D1751.

E. Liquid Curing Compound: Provide acrylic resin or dissipating hydrocarbon resin type as applicable to final floor finish as recommended by curing compound manufacturer.
1. Acrylic Resin Type:
a. VOC compliant, ASTM C309, Type 1, Class B; acrylic type.
b. W. R. Meadows Sealtight VOCOMP-20, L&M Construction Chemicals Dress & Seal WB, US Spec Hydrasheen 15%, or Dayton Superior J-18 or equal are acceptable products.

2. Dissipating Hydrocarbon Resin Type: US Spec Maxcure Resin Clear HS, water-based, high solid, dissipating resin curing compound or equal.
3. Verify that specified curing compound is compatible with the floor finish material(s) and adhesive(s) that will be applied to floor surface prior to delivery of curing compound to jobsite. If it is determined that the curing compound is not compatible with the floor finish material(s) and adhesive(s) that will be applied to floor surface, Contractor shall immediately notify Resident Engineer.

F. Sealer: VOC compliant, acrylic copolymer type.
1. Interior: ASTM C1315, Class B. Provide one of the following: W. R. Meadows VOCOMP-30, Euclid Super Aqua Cure VOX, L&M Construction Chemicals Dress & Seal WB #30 or Dayton Superior J-19 or equal are acceptable products.
2. Exterior: ASTM C1315, Class A. Provide one of the following: Euclid Super Diamond Clear VOX, L&M Construction Chemicals Lumiseal WB, W. R. Meadows VOCOMP-30 or US Spec “Radiance UV-25” Class A or equal are acceptable products.

G. Leveling Agent: Sonneborn Sonoflow, Euclid Flo-Top, Ardex K-15, L&M Construction Chemicals Levelex, US Spec "Self-Leveling Underlayment, or Dayton-Superior Levelayer 1 or equal are acceptable products.

H. Vapor Barrier Membrane: Conform to the following requirements.
1. Manufactured from prime virgin resins.
2. Strength (ASTM E-1745): Meets or exceeds Class A.
3. Permeance Rating: Maintain permeance of less than 0.01 perms (gr/ft^2/hr/in-Hg) as tested in accordance with conditioning tests per ASTM E 154 Sections 7.1.1-7.1.5.
4. Minimum thickness (ACI 302.2R-06): 15 mils.
5. Basis of Design: Stego Wrap 15- mil Vapor Barrier by Stego Industries LLC
6. Acceptable alternatives:
   a. W.R. Meadows Premoulded Membrane with Plasmatic Core.
   b. VaporGuard by Reef Industries, Inc.
   c. Or equal.
7. Accessories
   a Seam Tape:
      1) High Density Polyethylene Tape with pressure sensitive adhesive.
      2) Water Vapor Transition Rate (ASTM E96): 0.3 perms or lower.
      3) Minimum width 4 inches.
      4) Acceptable product: Stego Tape by Stego Industries LLC or equal.
   b. Vapor Proofing Mastic
      1) Water Vapor Transmission Rate (ASTM E 96): 0.3 perms or lower
      2) Acceptable product: Stego Mastic by Stego Industries LLC or equal.
   c. Pipe Boots: Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer’s instructions.

I. Concrete Accessories: Gateway Engineering Company, Dayton-Superior Corporation, or Burke Concrete Accessories or equal.

J. Evaporation Retarder:
1. Type: Monomolecular film, compatible with subsequent coatings and floor finishes.
2. Acceptable Manufacturer and Products: L&M Construction Chemicals (E-Con), Master Builders (Confilm), Sika (Sika Film), W.R. Meadows (Evapre), US Spec (Monofilm ER), or Dayton Superior (Surefilm J-74). U.S. Spec “Top-Etch” or equal.

2.03 MIXES

A. Design of Mixes: ACI 301 and ACI 304, except as otherwise specified.

B. Selection of proportions for normal weight concrete: ACI 301.

C. Mix and deliver ready-mixed concrete in accordance with requirements of ASTM C94, Option A.
1. Not more than 90 minutes shall elapse from time water is introduced into the concrete mixture until completion of placement.
2. Do not add water to mix that has stiffened to increase its workability.
3. At no time shall concrete mix exceed a bulb thermometer reading of 90 degrees F. or over.
4. Use ice or other method as reviewed by Resident Engineer, to keep concrete below 90 degrees F. temperature.

D. Water-cement ratio: In accordance with Cast-in-Place Concrete Notes on the structural drawings and as follows
1. Concrete used for interior slab on grade construction: 0.40 to 0.45.

E. Use of water reducing admixture, if needed, shall be submitted for approval. Proportion water reducing admixture in accordance with Manufacturer's recommendations. Delivery tickets shall state the amount and kind of admixture.

F. Air Entraining Admixture: All concrete exposed to freezing and thawing and/or required to be watertight shall have an air content of 4.5 to 7.5 percent in accordance with ACI 212.3R. All interior, slabs subject to vehicular abrasion, shall have a maximum air content of 3 percent.
1. Limit air content for lightweight concrete to 4-6 percent.

G. Compressive strength (28 day): In accordance with Cast-in-Place Concrete Notes on the structural drawings.

H. Slump: In accordance with Cast-in-Place Concrete Notes on the structural drawings.

I. Concrete: Per structural drawings.
1. Foundations.
2. Slab on Grade.
3. Slab on Grade Apparatus.
4. Walls.
5. Concrete on Metal Decks.

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to placing concrete:
   1. Clean equipment involved.
   2. Remove debris and foreign material from the forms.
   3. Remove concrete laitance from reinforcing steel.
   4. Wet wood forms and masonry units in contact with concrete.

B. No wood other than built-in bucks or nailing blocks will be permitted to remain permanently inside the forms.

C. Coordinate the necessary Trades as required to provide the sleeves, bolts, anchors, holes, etc., to be built in.

D. Vapor Barrier: Place vapor barrier over subbase immediately prior to placing of floor slab. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643. Vapor barrier shall be continuous over entire floor area and turned up a minimum of 2 inches and sealed to perimeter walls and penetrations. Tears, punctures and penetrations shall be taped to maintain the moisture vapor resistance integrity of vapor barrier.
   1. Ensure that subsoil is approved by Resident Engineer. Level and tamp or roll aggregate, sand or tamped earth base.
   2. Unroll Vapor Barrier with the longest dimension parallel with the direction of the pour. Lap Vapor Barrier over footings and seal to foundation walls.
   3. Overlap joints 6 inches and seal with manufacturer's tape.
   4. Seal all penetrations (including pipes) with manufacturer's pipe boot.
   5. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
   6. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

3.02 PLACING OF CONCRETE

A. Concrete Work shall be performed in accordance with ACI-301 except as amended by this Section.

B. Convey concrete from the mixer to place of final deposit by methods which will prevent segregation of aggregate or loss of material. Place concrete at such a rate that concrete is at all times plastic and to insure a practically continuous flow of concrete. Concrete not in place 1-1/2 hours after water has been added at batch plant may be rejected by Resident Engineer.

C. Place concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Do not deposit concrete that has partially hardened or been retempered.

D. Do not place concrete during rain unless adequate protection has been provided.

E. Thoroughly compact concrete by suitable means during the placing, and work around the reinforcement and embedded items into the corners of the forms.
   1. Use vibrators to aid in the placement of the concrete, operated by experienced personnel.
   2. Keep at least one spare operating vibrator on the job at all times during the concrete operations.

3.03 CONSTRUCTION JOINTS, EXPANSION/CONTRACTION JOINTS AND CONTROL JOINTS

A. Construction Joints: Provide as required to facilitate construction in accordance with reviewed shop drawings.

B. Expansion/Contraction and Control Joints: Place expansion/contraction joints and control joints where required to ensure that undesirable thermal and shrinkage cracking of slabs is minimized.
1. See Drawings for locations of expansion/contraction joints and control joints in slabs-on-grade and in topping pours.
2. If drawings do not indicate locations, verify with Resident Engineer prior to placement of slabs-on-grade and topping pours.
3. At exterior slabs-on-grade provide a 1/2 inch wide expansion/contraction joint wherever slabs abut vertical construction elements whether indicated or not.

C. Additional reinforcing may be required at some construction, expansion/contraction and control joints, and shall be supplied and installed at no additional cost.

D. Reinforcing shall be continuous through construction joints. No concrete pour shall be longer than 100 feet or more than 4,000 square feet in area. Provide shear keys as detailed.

E. Provide support of formed construction joint materials by means that does not puncture or otherwise damage under floor vapor retarder at interior floor slabs on grade.

3.04 FINISHING VERTICAL (FORMED) SURFACES

A. Formed surface finishes:
1. Pits, tunnels, mechanical rooms and concealed surfaces: Remove fins, patch tie holes.
2. Interior exposed surfaces and exterior exposed surfaces: Remove fins, patch tie holes, stone joint marks and out-of-plane surfaces to within 1/16 inch of flush, to produce uniformity, dense and smooth concrete.

3.05 FINISHING HORIZONTAL SURFACES

A. Rake concrete into place, screed and compact with a light tamp, except do not tamp topping and slabs not on grade. Screed with sawing motion and float surface to bring fines to the top.

B. Mix and apply evaporation retarder in accordance with manufacturer's printed instructions immediately after floating. In extreme drying conditions, apply additional material as needed. Apply lightly on hard to trowel floor areas.

C. When concrete has hardened sufficiently so that excess fines will not be brought to the surface, trowel slab with a steel trowel to a smooth surface free of pinholes and other imperfections. A mechanical trowel with rotating steel blades, approved by Resident Engineer, may be used for this operation.

D. After the surface has hardened sufficiently to ring under a trowel, trowel again with a steel trowel to a hard, burnished surface free of blemishes. A mechanical rotating trowel will not be permitted for this operation.

E. Use a small radius edger on edges of exposed Work. Use a deep cutting, scoring tool or sawcutting to provide scoring for control joints as indicated unless otherwise noted or directed.

G. Exterior flatwork to receive medium broom finish unless otherwise indicated on the Drawings.

H. Finish floors shall meet requirements of ACI 302.1R for a Flat (3/16 in 10'-0") Classification. Floors scheduled to receive thin-set tile applications shall meet Very Flat (1/8 inch in 10'-0") Classification.

3.06 SLABS

A. Saw cut or score control joint pattern indicated on Drawings. Use 3/16 inch thick blade or scoring tool, cutting 1/4 of depth of slab thickness.

B. Slope to drains 1/4 inch per foot nominal across entire room or area to be drained.

C. Exposed floor slabs to be hard troweled and sealed where left exposed in the finish work.

3.07 APPARATUS BAY FLOOR

A. The apparatus floor shall be poured in keyed sections using greased rods to connect each section.

B. Sections shall be poured in a manner to slope to floor drains at each bay.

C. Where concrete comes in contact with side walls, front and rear driveways, and any other surface, the floor shall be fitted with zip cap felt and caulking.

D. The finished concrete shall be cleaned and sealed in the final phase of finish construction.

E. Protection: Protect apparatus bay concrete slabs from damage, by covering with a one inch layer of clear, dry sand. Provide planking whenever scaffolding or wheeled equipment may be required to be erected over slabs. Damage to slabs prior to acceptance of the Work will be cause for rejection of slabs and replacement will be required.

3.08 REPAIR OF SURFACE DEFECTS

A. Modify or replace concrete not conforming to required lines, detail and elevations.

B. Repair or replace concrete not properly placed, resulting in excessive honeycombing and other defects. Do not patch, repair or replace exposed architectural concrete except upon express direction of Resident Engineer.

C. After forms are removed, fill tie rod holes, correct honeycomb spots, remove fins and clean and finish damaged surfaces. Wipe off excess mortar and rub to match adjoining surfaces.

D. When excessive honeycombing is revealed, remove the defective material immediately after stripping forms to a depth of 3/4 inch to 1 inch. Cut edge of area perpendicular to surface to avoid feathered edges. Saturate with water for several inches beyond cutout and brush-in a grout consisting of equal parts Portland cement and sand. Follow immediately with the patching mortar. Leave the patch slightly higher than the surrounding surface. After an hour or two, finish flush with the adjoining surface. Wipe and rub patch to match adjoining surfaces. Keep patches moist for 7 days.

E. Patching mortar shall consist of the same materials and proportions as the original concrete except that the coarse aggregate shall be omitted. When color match is required, adjust mixture to produce a finished color to match the adjoining concrete surfaces.

F. Cracks caused by expansion, shrinkage and the like that occur in natural color concrete up through final acceptance of building shall be carefully patched with floorstone, epoxy grouting mortar or other method acceptable to the Resident Engineer.

3.09 CURING

A. Work performed under this section shall also comply with the requirements of the Concrete Curing within Structural Notes on the structural drawings.

B. Protect freshly deposited concrete from premature drying and maintain 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.

C. Curing Methods: Cure concrete surfaces receiving finish materials, including, but not limited to; cementitious toppings, paint, and flooring, using one of the following two methods immediately after finishing operations. Consideration shall be given to the construction schedule impact and the compatibility of finish materials with the concrete when selecting a method.

1. Keep concrete continuously moist for at least 7 days using polyethylene film or other acceptable covering. Interior floor slabs on grade shall be continuously moist cured for a minimum of 7 days in accordance with ACI standards, liquid curing compounds shall not be acceptable.
2. Apply liquid curing compound in accordance with the manufacturer's instructions. Remove curing compound before finish materials are applied unless it has been demonstrated that the curing compound can satisfactorily serve as a base for finish materials. Method of removal shall result in a satisfactory base for finish materials.

D. Prevent rapid drying of the concrete at the end of the curing period.

E. During the curing period, protect the concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibrations. Protect finished concrete surfaces from damage caused by construction equipment, materials or methods.

3.10 LEVELING AGENT

A. Apply leveling agent to correct unsatisfactory floor surface due to undue settlement, shrinkage or cracking.

B. Apply material when, in the opinion of Resident Engineer, it is necessary to provide an acceptable surface.

C. Application to be in accordance with Manufacturer's directions.

3.11 FLOOR SEALER

A. At areas indicated on Drawings, provide 2 coats of sealer (CONC-1).

B. Surface must be clean, dry and free of loose dirt, oil, wax, curing and parting compounds and other foreign matter.

C. Apply each coat in accordance with Manufacturer's printed instructions.

3.12 FIELD QUALITY CONTROL

A. Tests: Inspection and testing of concrete mix will be performed by a testing laboratory in accordance with Section 01 45 00.
1. Provide free access to Work and cooperate with appointed firm.
2. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.
3. Four concrete test cylinders shall be taken for every 100 or less cubic yards of concrete placed. One cylinder shall be tested after 7 days for information. Test two cylinders after 28 days. Hold one cylinder for additional information, as required.
4. Take one additional test cylinder during cold weather concreting, and cure on job site under same conditions as concrete it represents.
5. Take one slump test for each set of test cylinders taken.
6. Concrete which does not meet the compressive strength requirement at 28 days will be rejected and removed from the Project, and disposed of in a legal manner.

B. Calcium chloride test requirements:
1. Two weeks before installation of the ceramic tile, VCT, vinyl, wood, carpet, epoxy flooring and/or other finish flooring systems over the interior concrete slabs, provide calcium chloride test to determine the level of water vapor transmission in the slab.
2. Conduct testing in accordance with ASTM F1869 or ASTM E1907 (quantitative anhydrous calcium chloride test).
3. Conduct calcium chloride tests after HVAC system has been in continuous use for 36 hours with a minimum ambient temperature of 72 degrees F. Water vapor transmission levels are directly affected by ambient room temperature and readings conducted without a sustained ambient temperature is NOT acceptable.
4. Document test results and provide copy to Resident Engineer with a marked up floor finish plan showing test results.
5. Provide a written clarification on status of HVAC system before and during the test and the length of time the ambient air temperature was maintained before the tests.

3.13 PROTECTION

A. Protect finished surfaces from stains or abrasions. Protect surfaces or edges by leaving forms in place or by providing temporary covers. Protect concrete from rain, flowing water or mechanical injury.

B. Protect floor slabs from the droppings of plaster, paint, dirt, and other marring by covering with polyethylene plastic sheet, or other acceptable floor protection covering, well lapped and sealed.

1. Method used to hold plastic sheets and coverings in place where slabs comprise the finished surface shall not leave permanent discoloration. Duct tape (and other similar adhesive tapes) shall not be used to hold coverings in place on floor slabs that will remain exposed in the final work.
2. Where concrete slabs are scheduled to be the finished floor surface, or where slab is treated with a special concrete finish serving as the finished floor surface, provide a continuous covering of 1/2 inch particle board, joints tightly butted and cut to sizes tight to wall construction, over entire floor area over polyethylene plastic sheet, or other acceptable floor protection sheeting.
   a. Particle board (wood and agrifiber products) must contain no added urea-formaldehyde resins in accordance with the requirements of "Low Emitting Materials" as specified in Section 01 60 00 - Materials and Equipment.
   b. Maintain covering (polyethylene and particleboard) in good condition until danger of damage is past.

3.14 CLEANING

A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises.

B. Construction Waste: In accordance with Section 01 74 19.

C. Storm Water Control: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

D. Environment Protection: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

END OF SECTION

SECTION 04 01 20.52

MASONRY CLEANING

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Performance Requirements: The application of chemical cleaner shall leave the finished surfaces uniform in color and shall not alter the natural texture of the masonry units.

1.02 SUBMITTALS

A. Submit samples and manufacturer's instructions for masonry cleaning chemicals for approval prior to delivering materials to the site or commencing the work in this Section.
   1. Cleaning compound manufacturer shall procure and apply cleaning solutions to samples of the masonry units to be used in the structure which will be reviewed by the Resident Engineer for both aesthetics and effectiveness.
   2. Cleaning compound manufacturer's instructions: Submit current method of application for cleaning chemicals stating the actual application rates.

1.03 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Engaged in producing materials with a satisfactory performance record for at least 2 years.
   2. Applicator: Trained, approved and accepted by the cleaning compound manufacturer. Application personnel shall have at least 2 years experience with the particular materials being applied.

B. Field Samples:
   1. A test area of wall surface from 10 to 20 square feet in size shall be cleaned with the chemical cleaner recommended by the cleaning compound manufacturer for acceptance by the Resident Engineer.
   2. Test samples of adjacent non-masonry materials for possible reaction with the diluted cleaning materials. Samples to be available for review by the Resident Engineer.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Delivery shall be made to the job site in manufacturer's original containers with seals unbroken and labeled with manufacturer's batch number.

B. Storage and Protection:
   1. Store materials in original, unopened containers in compliance with manufacturer's printed instructions.
   2. Do not store in areas where temperature will fall below 20 degrees F. or rise above 100 degrees F..

1.05 PROJECT/SITE CONDITIONS

A. Physical Requirements for Proper Installation or Application: Temperature and relative humidity conditions for a period before, during and after application shall be as recommended by the manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Chemical Cleaner:
1. Cleaner shall be a solution of blended liquid acids, heavily inhibited and emulsified and in combination with special wetting systems.
2. Specific product selection shall be dependent upon substrate as recommended by the chemical cleaner manufacturer.
3. Cleaner shall be acceptable to the masonry unit manufacturer.
4. Muriatic acid shall not be acceptable as a chemical cleaner for new masonry.
5. Acceptable Manufacturers and Products:
   a. Sure-Klean Vana Trol and Sure-Klean No. 600 Detergent as manufactured by ProSoCo, Inc., www.prosoco.com
   b. 202V Vana-Stop and 202 New Masonry Detergent as manufactured by Diedrich Technologies www.diedrichtechnologies.com are acceptable products.
   c. Or equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
1. Prior to start of work, carefully inspect the installed work of other trades, and verify that such work is complete to the point where this work may commence.
2. The chemical cleaner manufacturer's representative shall verify that the chemical cleaner may be applied in accordance with the manufacturer's recommended methods.
3. In the event of discrepancy, immediately notify the Resident Engineer.
4. Commencement of system application constitutes acceptance of surfaces by applicator.

3.02 PREPARATION

A. Protection:
1. Use all means necessary to protect the installed work of other trades.
2. Concrete sidewalks shall be protected from runoff by soaking with water immediately prior to application on adjacent walls.
3. Adjoining glass, metal and painted surfaces shall be protected from overspray and splash of chemical cleaner. Inadvertent splashes shall be removed in an approved manner before the solution has damaged the surface.
4. In the event of damage, immediately make all repairs and replacements necessary to the approval of Resident Engineer and at no additional cost to Owner.

B. Surface Preparation for Chemical Cleaner:
1. In strict accordance with manufacturer's printed instructions.
   a. Masonry walls shall be cleaned within 14 to 28 days after installation.
   b. Walls shall be free of excess mortar.
   c. Cracks, other than hairline cracks, shall be pointed up.
   d. Defective mortar joints shall be routed out, pointed with mortar and tooled.

2. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

C. Presoaking Hoses:
1. Adequate water supply shall be made available to assure thorough pre-soaking and thorough rinsing of the wall before undertaking general cleaning.
2. Two water hoses shall be used by the cleaning crew.
3. One hose shall be attached to a length of lawn soaker hose placed along the top of the wall to provide a uniform and complete saturation of the entire wall area.
4. The second hose shall provide a copious flow of water for thorough flushing of excess mortar and dirt from the scrubbed areas.
5. The lawn soaker hose is later to be placed at the face of the scaffold or stage to provide a continuous spray of wall areas below the working area.

3.03 APPLICATION

A. Chemical Cleaner: Application to be in strict accordance with manufacturer's printed instructions and as follows:
1. Surfaces shall be thoroughly pre-soaked with clean water to prevent the absorption of the cleaning solution within the pores of the masonry.
2. Cleaning solution shall be diluted with clear water and applied to pre-soaked wall areas with a long handled stiff fibered masonry wall washing brush, or other brush as recommended by the cleaning compound manufacturer. The cleaning solution may also be applied with a garden-type low pressure sprayer having a maximum nozzle pressure of 50 psi (3.5kg/cm^2). Allow the solution to remain on the wall 5 to 10 minutes, or as recommended by the cleaning solution manufacturer. Wooden paddles or other non-metallic tools may be used to remove stubborn particles. Cleaning shall be restricted to small areas of up to 20 square feet at a time.
3. After washing a given area, the wall shall be flushed with a copious amount of clear water, working from top to bottom, before the solution dries on the wall surface. All of the cleaning solution shall be completely rinsed off of the wall.
4. Rinsing water may be applied with a high-pressure hose system with a maximum nozzle pressure of 700 psi . The high-pressure nozzle tips shall have a fan spray angle of from 15 to 45 degrees. The high-pressure system shall have a water flow rate of 3 to 8 gallons per minute. Care shall be taken to avoid damaging the brick unit or the mortar joints with the high-pressure water spray.
5. Repeat the procedure on spots which require additional cleaning.
6. Clean roof side and top of parapet walls.

3.04 CLEANING

A. Construction Waste: In accordance with Section 01 74 19

B. Water Pollution Control: In accordance with Greenbook/Whitebook requirements.

C. Storm Water Control: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

D. Environment Protection: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

END OF SECTION

SECTION 04 05 15

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.01 SUMMARY

A. Work performed under this section shall also comply with the requirements of the Structural Notes on the structural drawings.

1.02 SUBMITTALS

A. Mix Designs: Submit mix designs and samples to the Resident Engineer for review prior to delivering materials to the site or commencing the Work.
1. Mortar Mix Design: Furnish in accordance with ASTM C270.
2. Grout Mix Design: Furnished by either the grout supplier or an independent testing laboratory. Submit comprehensive strength data with mix design submittals when pozzolans are used.

B. Product Data: If alternative mortar materials are to be provided, submit current instructions stating the actual quantities and mixing instructions for alternative mortar materials to conform to specified requirements.
1. Submit test report data substantiating compliance with specified performance requirements.
2. Submit current ICC Evaluation Report.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection: Cementitious materials shall be stored off the ground, under cover and shall be kept dry.

B. Preblended Mortar Mix Delivery System: The use of dry preblended mortar silos and bulk bags shall be acceptable. Bulk bags and silos shall be sealed to prohibit contamination of the ingredients and to keep the materials dry until mixed.

1.04 PROJECT/SITE CONDITIONS

A. Physical Requirements for Proper Installation or Application:
1. Hot Weather Requirements: Wet mortar board before loading and cover mortar to retard drying when not being used.
2. Cold Weather Requirements: In accordance with "Recommended Practices and Guide Specifications for Cold Weather Masonry Construction" by IMIAC; provide adequate equipment for heating the mortar and grout materials, when air temperature is below 40 degrees F.. Temperatures of the separate materials, including water, shall not exceed 140 degrees F. when placed in the mixer. When air temperature is below 32 degrees F., maintain mortar temperature on boards above freezing.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Mortar:
1. Cement: Type II Portland cement conforming to ASTM C150, except that mortar used below grade shall have Type V Portland cement.
2. Aggregate: Clean, sharp and well graded and free from injurious amounts of dust, lumps, shale, alkali, surface coatings and organic matter, conforming to ASTM C144, except that no less than 3 percent nor more than 10 percent shall pass a No. 100 sieve.
3. Hydrated Lime: ASTM C207, Type S.
4. Water: Clean and potable.
5. Admixtures:
   a. Chemical: The use of accelerator admixtures, water reducing plasticizers and other chemical admixtures shall not be allowed.
   b. Mineral: In accordance with Section 03 05 05
   c. Alternative Plasticizer: Pozzolanic formulation consisting of a combination of hydroxy aluminum silicates and diatomite:
      1) Alternative Plasticizer Manufacturer: Engaged in producing materials with a satisfactory performance record for at least 2 years.
      2) Mortar mix design shall be in accordance with ICC Evaluation Report, in accordance with the mortar type specified elsewhere in this specification.
      3) Provide alternative plasticizer in accordance with manufacturer's printed instructions, including specific mixing instruction.
      4) No other admixtures shall be used in conjunction with the alternative plasticizer unless approved in writing by the alternative plasticizer manufacturer.
      5) Packing and Shipping: Mortar admixture(s) shall be delivered to the job site in manufacturer's original containers with seals unbroken and labeled with manufacturer's batch number.

C. Grout:
1. Cement: Type II Portland cement conforming to ASTM C150.
2. Aggregate: ASTM C404 and as follows:
   a. Sand: Size No. 1 for fine aggregate.
   b. Pea Gravel: Size No. 8 for coarse aggregate.
3. Water: Clean and potable.

2.02 MIXES

A. Mortar: ASTM C 270, Type S, except that mortar used below grade shall be Type M.
1. Measurement: Accurately measure materials by ASTM C270 by the Property Method per Table 2.
2. Mix cementitious materials and aggregates 3 to 5 minutes in a mechanical mixer. Small amounts of mortar may be mixed by hand. Adjust consistency of the mortar depending on the absorptive quality of the units being laid, and to the satisfaction of the mason.
3. If mortar begins to stiffen, it may be retempered by adding water within a basin formed by the mortar, and remixing.
4. Use within 2-1/2 hours of initial mixing and no mortar shall be used after it has begun to set or after is has become harsh or non-plastic.
5. Preblended Mortar Mix: Provide mortar as specified herein, except that dry ingredients may be preblended and bulk packaged for delivery to a jobsite silo (which loads into batch mixer) or bagged for hand loading into mixer. Moisture shall be extracted from sands. Digital printouts displaying the proportions of each batch shall be submitted to the Resident Engineer upon request. Mixing shall be accomplished by mechanical mixer in accordance with instructions provided by Preblended Mortar Mix Distributor.

B. Grout:
1. Job-Site Mixed: In accordance with ASTM C476.
2. Transit-Mixed:
a. Designed by the supplier or an independent testing laboratory with a minimum compressive strength of 2000 psi (140mPa) in 28 days, unless higher strength is required by the Structural Drawings and Notes.
b. Slump: Not to exceed 8 inches, unless otherwise noted on Drawings.
c. Use within 1-1/2 hours of initial mixing and use no grout after it has begun to set or after it has become harsh or non-plastic.
d. Course grout may be used in cavity walls with a horizontal dimension of 2 inches or more, and in hollow cell construction 4 inches or more in both horizontal directions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation of mortar and grout shall be as specified under Section 04 22 00 – Concrete Unit Masonry.

B. Temperature: Mortar and grout shall have a temperature between 50 degrees F. and 90 degrees F. while being used.

C. Grout may be poured by hand bucket, concrete hopper or though a grout pump. Grout spaces shall not be wet down prior to pouring grout.

3.02 FIELD QUALITY CONTROL

A. General: Tests and inspections as necessary to verify quality and strength of mortar and grout. Laboratory tests shall conform to applicable ASTM standards and tests.

B. Tests:
1. Frequency: As determined by the Resident Engineer based upon total time for construction of masonry with not less than two tests per each level of masonry construction, foundation to roof or floors.
2. Testing Laboratory: Inspection and testing of concrete mix will be performed by a testing laboratory in accordance with Section 01 45 00. The testing laboratory, in addition to meeting requirements of ASTM E329, must be an approved laboratory competent to perform cement physical testing.
3. Distribution of Results of Tests: Within 24 hours of results of tests, copies of the results shall be submitted to the Resident Engineer, Contractor, masonry contractor, and the grout supplier if applicable.

C. Mortar:
1. Property Specification (ASTM C270): Testing in accordance with ASTM C 780.
2. For determining hardened mortar properties, prepare 3 test specimens for each test age and property. A strength test shall be the average of the strengths of the specimens tested at the age specified. Specimens shall be tested at 7 and 28 days.

D. Grout:
1. Testing per ASTM C1019.
2. Three test specimens shall constitute one sample. A strength test shall be the average of the strengths of the specimen tested at the age specified.
3. Specimens shall be tested at 7 and 28 days.
4. The compression strength will be considered satisfactory if the average of three consecutive tests of the grout is equal to or greater than the specified strength and no individual strength test falls below the specified strength by more than 500 psi.

3.03 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

B. Construction Waste: In accordance with Section 01 74 19.

C. Storm Water Control: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

D. Environment Protection: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

END OF SECTION

SECTION 04 05 23

MASONRY ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Furnishing the following items for installation under Section 04 22 00:
1. Ties.
2. Anchors.
3. Control joints.
4. Through wall flashings.
5. Weep holes.

1.02 SUBMITTALS

A. Product Data: Submit Manufacturer's brochures depicting each of the masonry accessories which will be used prior to delivering materials to the site or commencing the Work in this Section.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection: Store metal items at the site off the ground and in a manner to prevent damage to the materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following Manufacturers, subject to compliance with Specification requirements.
1. Dur-O-Wall Inc. www.dur-o-wall.com
2. Heckmann Building Products, Inc. www.heckmannbuildingprods.com
3. Hohmann and Barnard, Inc. www.h-b.com
4. Or equal.

2.02 MATERIALS

A. Recycled Content
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Minimum 26% post-consumer and 7% pre-consumer recycled content.

B. Steel Wire: ASTM A82, diameter as specified for accessory.

C. Flat and Corrugated Sheet Steel: ASTM A653 or ASTM A568.

D. Bar Anchor Material: ASTM A36.

E. Galvanized Finish: ASTM A641, Class 1, mill galvanized for interior walls, or ASTM A153, Class B-2, hot dip galvanized for exterior walls.

F. Reinforcing Steel: As specified in Section 03 20 00.

2.03 ACCESSORIES

A. General: Anchors and ties shall be steel with zinc coated finish or shall be of other non-corrosive metal.

B. Joint Reinforcing: Ladder type, galvanized steel rods of width 2 inches less than wall thickness conforming to ASTM A951, corrosion protective finish with longitudinal wires not less than 0.148 inch (3.75mm) or more than one half the mortar joint thickness and cross wires not less than 0.148 inch (3.75mm) nor more than the diameter of the longitudinal wires with cross wires projecting nor more than 1/8 inch (3.2mm) beyond the outside longitudinal wires. Joint reinforcing shall be in accordance with requirements of IBC 2009, Chapter 21, and the Structural Drawings.

C. Anchors:
1. Dovetail Anchor: 16 gage flat sheet steel, one inch wide, 5-1/2 inch length, designed for use with embedded slot or inserts.
2. Bar Anchors: Machine made corrosion protected metal with cross section area not less than .25 square inch with ends turned up 2 inches, not less than 16 inches long for 8 inch walls nor less than 24 inches long for 12 inch walls.

D. Control Joints:
1. Rubber: Extruded, solid section, ASTM D2000 2AA-805 with a durometer hardness of 70 or 80 when tested per ASTM D2240.
2. Polyvinyl Chloride (PVC): ASTM D2287, Type PVC 654-4 with a durometer hardness of 85 (+5) when tested per ASTM D2240, minimum tensile strength of 1750 psi with minimum 300 percent elongation per ASTM D638, and cold crack brittleness of 50 degrees F per ASTM D746.
3. Sizes and Profiles: As indicated on Drawings.

E. Joint Filler: Closed cell neoprene rubber conforming to ASTM D1056, Grade 2A1, oversized 50 percent, self expanding, 2-3/4 or 3 inch width by maximum length.

F. Through-Wall Flashing:
1. Granular surfaced Self-adhering, flexible flashing consisting of pliable and highly adhesive rubberized asphalt compound overall 60 mil thickness; protected from contamination from dust or dirt by a silicone-coated release sheet, to be removed immediately before installation.
2. Vycor Basik as manufactured by W.R. Grace & Co. - Conn., Cambridge, MA (800) 558-7066 or equal.
3. Provide wall flashing accessories (surface conditioner, termination mastic) as required to provide a complete installation.

G. Weep Holes: polyethylene plastic tubing, 1/4 inch diameter x 4 inch long.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Installation of masonry accessories shall be as specified under Section 04 22 00 – Concrete Masonry Units.

B. Control Joints: Provide control joints 20'-0" minimum in run as indicated on Drawings and in accordance with the requirements of Specification Section for the masonry units.

C. Through Wall Flashing:
1. Provide through-wall flashings as indicated on Drawings and in accordance with the requirements of Specification Section for the masonry units.
2. Specified flashing and accessories are not designed for use as a finished surface or for use in areas where they will be exposed to sunlight. Prevent contact with products containing fresh coal tar or coal tar pitch. Prevent contact with sealant products containing polysulfide polymers due to incompatibility.
3. Remove deleterious materials from surfaces to be flashed.
4. Apply surface conditioner by spray, brush or roller at the rate recommended by manufacturer to dirty or dusty surfaces or surfaces having an irregular or rough texture before installing flashing membrane.
5. Remove silicone-coated release paper and position flashing carefully before placing it against the surface. When properly positioned, place against surface by pressing firmly into place by hand roller or blunt object, such as the backside of a utility knife. Fully adhere flashing to substrate to prevent water from migrating under flashing.
6. Overlap adjacent pieces 2 inches and roll overlaps with a steel hand roller or a blunt object. Fully seal overlaps to prevent water leakage through laps. Trim bottom edge 1/2 inch back from exposed face of the building.
7. At heads and sill where flashing is indicated to be placed, turn up ends a minimum of 2 inches and make careful folds to form a pan, with the pan seams sealed with compatible mastic acceptable to flashing manufacturer.
8. Apply a bead or trowel coat of compatible mastic acceptable to flashing manufacturer along top edge, seams, cuts and penetrations. Seal penetrations through flashing with compatible mastic acceptable to flashing manufacturer.

D. Weep Holes: Provide weep holes as indicated on Drawings and in accordance with the requirements of Specification Section for the masonry units.

3.02 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 04 21 33

THIN BRICK VENEER MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section Includes: Thin brick masonry units over brown/scratch coat waterproof system over fiberglass faced gypsum sheathing panels.

B. Related Sections:
1. Section 05 41 00 - Load-Bearing Metal Stud System: Metal Framing at exterior wall construction.
2. Section 07 19 00 - Water Repellents.
3. Section 07 42 43.13 - Solid Composite Exterior Wall Panel Systems: Exterior panel dry system over breathable underlayment membrane over fiberglass faced gypsum sheathing panels.
4. Section 09 24 00 – Portland Cement Plaster (Stucco): Stucco over fiberglass faced gypsum sheathing panels.

1.02 SUBMITTALS

A. Samples: Submit samples to the Architect and Resident Engineer for review prior to constructing job-site mock-ups, delivering materials to the site or commencing the work in this Section.
1. Thin Brick Samples:
   a. Provide 8 samples of thin brick, in size and shape to be used on the Project showing range of texture and/or color variations of the exposed surfaces.
   b. Units provided to the Project shall match these samples.
2. Mortar Color Samples:
   a. Submit mortar channels for color selection.
   b. Submit written colored mortar proportions for each color of mortar to be supplied for review by the Architect.

B. Procedures: Submit requirements for hot and cold weather protection.

C. Shop Drawings:
1. Submit Manufacturer's installation instructions and field erection or setting drawings.
2. Indicate layout, pertinent dimensions, anchorages, reinforcement, head, jamb and sill opening details, and jointing methods.

D. Product Data:
1. Provide product data on thin brick units.
2. Provide product data for weather resistive barrier including manufacturer’s specifications, technical data and installation instructions. Submit manufacturer certification that weather resistive barrier product furnished meet specification requirements.

E. Thin Brick Maintenance: Submit thin brick supplier's literature or instructions for preventive care and maintenance measures pertinent to the specific thin brick finishes for normal maintenance and special cleaning procedures.

F. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Thin Brick Manufacturer: Company specializing in manufacture of products specified in this Section with minimum 2 years documented experience.

B. Applicator Qualifications: Company with minimum 2 years experience in the installation of manufactured thin brick veneers of the type specified.

C. Regulatory Requirements:
1. Materials and workmanship shall meet requirements of the building codes which are applicable to the jurisdiction in which Project is located.
2. Provide weather resistive barriers that are manufactured in accordance with ICC approval acceptable to authorities having jurisdiction as a weather resistive barrier.

D. Thin brick shall be sound, durable and free of visible defects which will impair the strength, durability or appearance; or concentrations of material that will cause objectionable staining or weakening under normal environments of use.

E. Thin brick shall be obtained from a single manufacturer having adequate capacity and facilities to meet the specified requirements, and by a firm equipped to process the material promptly and in accordance with the Specifications. The Owner and/or Architect reserve the right to approve the material supplier for thin brick prior to award of Contract.

G. Mock-Ups: Prior to start of work, construct a sample panel from the approved materials, containing each different kind or color of thin brick, approximately 4 feet high x 6 feet long or as required to illustrate wall design under the direction of the Architect.
1. Sample wall shall provide a standard of workmanship, bond, thickness and tooling of joints, range of color and texture of the thin brick and mortar.
2. Request Architect's review only after sample wall mortar is dry.
3. Construct successive sample panels until the standard is approved.
4 When accepted, sample wall shall be the standard of comparison for the remainder of the thin brick work.
5. This sample, when accepted by the Architect, will function as a reference base for acceptance or rejection of final work.
6. Sample wall shall be reviewed by the Architect's contract administrator for acceptance.
7. Upon completion of the Project, remove the sample wall from the site and dispose of in a legal manner.

1.04 DELIVERY, STORAGE AND HANDLING

A. Thin Brick:
1. Transport and handle thin brick in such a manner as to prevent chipping and breakage.
2. Deliver and store materials in dry, protected areas.
3. Keep free of stain or other damage.
4. Locate storage piles, pallets, stacks or bins to avoid or protect material from heavy or unnecessary traffic.
5. Replace damaged material at no cost to Owner.

B. Weather Resistive Barrier:
1. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
2. Storage: Store off ground to assure adequate ventilation, and protect against damage while stored at the site.
3. Handling: Comply with manufacturer's instructions.

C. Gypsum Sheathing:
1. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
2. Storage: Store panels flat in an enclosed shelter providing protection from damage and exposure to the elements.

1.05 PROJECT/SITE CONDITIONS

A. Perform Work only when existing and forecasted weather conditions are within the limits established by the Manufacturer of the materials and products used.

B. Proceed with installation only when substrate construction and preparation Work is complete, dry and in condition to receive weather resistive barrier.

C. Hot Weather Requirements:
1. When the ambient air temperature exceeds 100 degrees F., or when the ambient air temperature exceeds 90 degrees F. and the wind velocity is greater than 8 mph, the Thin brick Contractor shall implement hot weather protection procedures as submitted to the Architect.
2. Do not spread mortar beds more than 4 feet ahead of placing thin brick.
3. Place thin brick within one minute of spreading mortar.

D. Cold Weather Requirements:
1. Fully protect thin brick against freezing by a weather-tight covering which shall also prevent accumulation of ice.
2. Do not lay thin brick when the temperature of the surrounding atmosphere is below 40 degrees F. or is likely to fall below 40 degrees F. in the 486 hour period after laying, unless adequate protection is provided.

E. Field Measurements:
1. Verify measurements shown on Drawings by taking field measurements.
2. Proper fit and attachment of thin brick is required.

1.06 SCHEDULING AND SEQUENCING

A. Coordination: Coordinate with other work relating to thin brick installation for placing required blocking, backing, furring, conduits and other items.

1.07 WARRANTY

A. Gypsum Sheathing:
1. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay).
2. Manufacturer’s Standard Warranty: Five years against manufacturing defects.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Thin brick shall be as manufactured by McNear Brick and Block or equal.

B. Gypsum Sheathing: Georgia-Pacific Gypsum LLC or equal.

2.02 THIN BRICK VENEER

A. General:
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Thin Brick Veneer: Conforming to ASTM C1088 and as follows.
1. Model: Standard
2. Type: TBS
3. Grade: SW
4. Size: 5/8" X 2-7/16 " X 8-1/8" .
5. Corner return dimension: 3-7/8"
6. Setting Method: Thin-set mortar
7. Color and Texture:
   a. Series: Sandmold
   b. Style: Salt House
8. Components:
   a. Stretchers: Provide manufacturer's standard.
   b. Corners: Provide manufacturer's corners to match stretcher units.
   c. Wall Caps and Corners: Provide manufacturer's wall caps and corners to match stretcher units as indicated on the Drawings.

C. Setting Materials:
1. If exposed to the interior of the building (i.e., inside of the weatherproofing system and applied on-site), provide materials in accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.
2. Pointing Mortar:
   a. Acrylic modified mortar, complying with specification, specifically manufactured or supplied by thin brick system manufacturer to suit application.
   b. LATICRETE Masonry Pointing Mortar or equal is acceptable.
3. Comply with pertinent recommendations contained in the Tile Council of America (TCA) "Handbook for Ceramic Tile Installation", Current Edition.
4. Mortar Materials: Thin brick installation materials to be supplied solely by LATICRETE International, Inc., Bethany, CT (203) 393-0010 www.laticrete.com
   a. Thick Bed Mortar (for smoothing rough/uneven substrates and/or use with wire lath): LATICRETE Premium Mortar Bed or equal.
   b. Masonry Mortar (for application of thin brick): LATICRETE Masonry Veneer Mortar or equal.
   c. Scratch and Brown Coat Mortar:
      1) Portland Cement: ASTM C150, Type 1; natural color.
      2) Aggregate: ASTM C114; standard masonry type sand; clean, dry protected against dampness, freezing and foreign matter.
      3) Hydrated Lime: ASTM C207, Type S.
      4) Quicklime: ASTM C5, non hydraulic type.
      4) Water: Clean and potable.

5) Type and Color: Colored Mortar type as recommended by the manufacturer and color selection by Architect and Resident Engineer.

5. Waterproofing and Crack Suppression Membrane: LATICRETE Air & Water Barrier or equal.
6. Epoxy-Based Waterproofing: LATAPOXY® Waterproofing Flashing Mortar or equal.

D. Mortar Mix:
1. Bonding Mortars: Prepare bonding mortar mixes in accordance with manufacturer's written installation instructions.
2. Grouting Mortars: Prepare grouting mortar mixes in accordance with manufacturer's written installation instructions.
3. Use mortar within 2 hours after mixing at temperatures of 80 degrees F, or two and one-half hours at temperatures under 50 degrees F.
4. Colored Mortar: Consistency of appearance shall be maintained throughout the project.

E. Accessories
1. Base Channel:
   a. "L" shaped, 0.063 inch aluminum extrusion, 2-1/2 inches high for back flange by thickness of panel, and thin brick veneer for bottom flange.
   b. Fasteners: Stainless steel washer plate and cover with appropriate screw for specified substrate.
2. Supports and Lintels: In accordance with Section 05 50 00 and as indicated on Drawings.
3. Ties, Anchors, Control Joints, and Weep Holes: In accordance with Section 04 05 23 and as indicated on Drawings.
4. Nailing Strips: In accordance with Section 06 10 53 and as indicated on Drawings.
5. Sheet Metal Flashings: In accordance with Section 07 60 00 and as indicated on Drawings.
6. Joint Sealers:
   a. Sealant and joint backing as specified under provisions of Section 07 92 00.
   b. Expansion Joints and other joints as specified herein - 100% Silicone Caulk: LATICRETE Latasil™ or equal.
7. Sealer: In accordance with Section 07 19 00 - Water Repellents.

2.03 SHEATHING, WEATHER-RESISTIVE BARRIER AND FURRING/ LATHING

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Gypsum Sheathing: Fire-Rated Fiberglass-Mat Faced Gypsum Sheathing conforming to ASTM C1177, Type X:
1. Thickness: 5/8 inch.
2. Width: 4 feet.
3. Length: 8 feet, 9 feet or 10 feet as applicable to project requirements.
4. Weight: 2.5 lb/sq. ft.
5. Edges: Square.
6. Surfacing: Fiberglass mat on face, back, and long edges.

7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 654 pounds per square foot, dry.
8. Flexural Strength, Parallel (ASTM C1177): 100 lbf, parallel.
9. Humidified Deflection (ASTM C1177): Not more than 1/8 inch.
10. Permeance (ASTM E96): Not more than 17 perms.
11. R-Value (ASTM C518): 0.67.
12. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
13. Microbial Resistance (ASTM D6329, GREENGUARD 3-week protocol): Will not support microbial growth.
14. Acceptable Product: 5/8 inch DensGlass Fireguard Sheathing, Georgia-Pacific Gypsum or equal
15. Fasteners: ASTM C1002, corrosion resistant treated screws.

C. Weather Resistive Barrier:
1. Weather resistive barrier composed of either cross-laminated polyolefin films, woven polyolefin strands, or spunbonded polyolefin fibers, coated or uncoated, with or without perforations to transmit water vapor but not liquid water complying with UBC Standard 14-1 or ICC approved alternative:
   a. Thickness: 3 mils minimum.
   b. Water Vapor Transmission: 10 perms minimum as tested per ASTM E96, Procedure A.
   c. Flame Spread: Maximum of 25 per ASTM E84.
   d. Minimum Allowable Exposure: 3 months.
2. Furnish one of the following products, except as approved by the Architect and Resident Engineer, subject to compliance with specification requirements:
   a. Tuff Wrap as manufactured by Celotex www.usg.com
   b. Tyvek CommercialWrap as manufactured by Dupont
   c. Or equal.
3. Fasteners:
   a. Nails: Standard round wire shingle type, hot dipped zinc coated steel, minimum 13/64 inch head diameter, or with plastic washer heads, and 0.080 inch shank diameter, of sufficient length to penetrate into wall studs.
   b. Staples: Standard wide face staples, hot dipped zinc coated steel, minimum 1 inch crown, of sufficient length to penetrate into wall studs.
   c. Screws: Steel drill screws with washers complying with ASTM C1002, Type S, hot dipped zinc coated steel, of sufficient length to penetrate steel framing.
4. Sealing Tape: Manufacturers standard pressure sensitive seam sealing of tape of polyolefin film coated with a permanent acrylic adhesive.
5. Joint Sealer:
   a. Polyurethane or latex based joint sealer acceptable or recommended by sheet manufacturer and complying with Section 07 92 00.
   b. If exposed to the interior of the building (i.e., inside of the weatherproofing system and applied on-site), provide materials in accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.
6. Adhesive:
   a. Polyurethane or latex based adhesive acceptable to sheet manufacturer.
   b. If exposed to the interior of the building (i.e., inside of the weatherproofing system and applied on-site), provide materials in accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

D. Wire Mesh Reinforcement: 2 x 2 inch galvanized steel, 24 gage wire, woven mesh.

E. Metal Lath: 2.5 lb./sq.yd. expanded metal diamond mesh, self-furring type; galvanized finish.

F. Tie wire shall be double annealed and galvanized conforming to Type I FS QQ-W-461, of gages specified.

G. Anchorages: Nails, staples, or other approved metal supports, of type and size to suit application, galvanized to rigidly secure lath and associated metal accessories in place.

2.04 SCRATCH & BROWN COAT MATERIALS FOR THIN BRICK VENEER

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Water: Clean and free of deleterious matter.

C. Portland Cement: Conform to ASTM C150, Type I or II.

D. Hydrated Lime: Conform to ASTM C207, Type S.

E. Aggregate shall be clean, well graded sand or screenings from crushed stone or slag, and shall conform to ASTM C33 for fine aggregate except that it shall be graded within the following limitations:
1. Passing No. 4 sieve: 100 percent
2. Passing No. 8 sieve: 90 percent
3. Passing No. 16 sieve: 60 percent-90 percent
4. Passing No. 30 sieve: 35 percent-70 percent
5. Passing No. 50 sieve: 10 percent-30 percent
6. Passing No. 100 sieve: 5 percent

2.05 PROPORTIONING AND MIXING OF SCRATCH & BROWN COAT FOR THIN BRICK VENEER

A. Accurately measure ingredients. Proportion successive batches exactly alike. Mix aggregate, cement and other dry materials until the mass is uniform in color and homogeneous before adding water. Determine the quantity of water necessary for the desired consistency by trial, and thereafter measure in proper proportions. Retempering will not be allowed.

B. Mortar for coats shall consist of one volume of Portland cement to not less than three or more than five volumes of damp, loose aggregate.

C. Hydrated lime, hydrated lime putty, or slaked lime putty may be added as a plasticizing agent, but the amount used shall not exceed 10 percent by weight nor more than 25 percent by volume of the cement used.

D. Mix materials dry, to uniform color and consistency, before adding water.

PART 3 EXECUTION

3.01 EXAMINATION

A. Preconstruction Conference: A conference shall be held at the jobsite prior to start of construction of this portion of the work to review substrates, flashing conditions, work provided by preceding trades and work required by trades following this work. General Contractor, subcontractor(s) affected by the work of this section, Architect and Resident Engineer shall be in attendance. If required, modifications shall be made to details and to specifications to address actual field conditions.

B. Gypsum Sheathing:
1. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.
2. Verify that surface of framing members do not vary more than 1/4 inch from the plane of faces of adjacent members.
3. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

C. Weather Resistive Barrier:
1. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.
2. Verify base, sill and other flashing materials are in place prior to installation of weather resistive barrier.

D. Thin Brick - Verification of Conditions:
1. Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer.
2. Failure to observe this requirement constitutes a waiver to subsequent claims to the contrary and holds Contractor responsible for correction(s) Architect and Resident Engineer may require.
3. Commencement of Work will be construed as acceptance of subsurfaces.
4. Verify, before proceeding with this Work, that required inspections of existing conditions have been completed.

E. Coordination with other Work: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION FOR THIN BRICK VENEER

A. Protection: Protect sills, ledges, offsets and other projections from dropping of brown coat materials and mortar.

B. Establish lines, levels, and coursing. Protect from disturbance.

C. Clean thin brick prior to erection. Do not use wire brushes or implements which will mark or damage exposed surfaces.

3.03 SHEATHING INSTALLATION

A. Gypsum Sheathing: In accordance with GA-253, ASTM C1280 and the manufacturer's recommendations and IBC requirements.
   1. Verify that surface of framing members do not vary from more than 1/4 inch from the plane of faces of adjacent members.
   2. Panels of the maximum length possible shall be used to minimize the number of joints. Edge joints must be located parallel to and with vertical orientations on framing. End joints of adjacent lengths of sheathing must be staggered.
   3. Cut board at penetrations, edges and other obstructions; and fit tightly against abutting construction, unless otherwise indicated.
   4. Fasteners must be driven so as to bear tight against and flush with surface of sheathing, but do not cut into facing.. Fasteners must not be countersunk.
   5. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
   6. Fasteners must be located a minimum of 3/8 inch from edges and ends of sheathing panels.

3.04 WEATHER-RESISTIVE BARRIER/LATHING FOR THIN BRICK VENEER

A. Cover sheathing completely with weather-resistive barrier prior to lathing installation.
   1. Apply material horizontally starting at outside corner with bottom aligned with foundation or bottom termination and plumb. Leave 6 to 12 inches of material at corner for overlap. Align stud marks on rolls with framing members of exterior wall.
   2. Use material as required to span floor to floor height and lap upper layer over lower layer 6 inches minimum. Lap vertical joints 6 inches minimum.
   3. Secure sheet to foundation with continuous bead of joint sealer.
   4. Wrap sheet 6 inches minimum around all corners lapped over adjacent sheet and taped.
   5. Extend sheet directly over window and door openings, cut and wrap material into opening, or trim material at openings and seal with tape as recommended by manufacturer.
   6. Fasten at 12 to 18 inches on center spacing at each vertical stud using the following fasteners:
      a. Fasten to sheathed wood frame construction with staples, large head nails, or plastic washer nails.
      b. Fasten to metal frame construction with steel drill screws with washers.
      c. Attach to masonry surfaces with adhesive.
   7. Lap upstanding flashing with 4 inch minimum overlap and secure with adhesive.
   8. Tape all seams, window and door penetrations, corners, and torn or damaged areas as recommended by sheet manufacturer and as detailed on Drawings.
   9. Completed installation shall be free of holes or breaks.

B. Lathing:
   1. Sheathed Surfaces: Install lath with the long dimensions of the sheet across supports and attach to thee studs or furring using 18 gage tie wire, or by nailing or by equivalent attachment space at intervals not exceeding 6 inches o.c. vertically and 16 inches o.c. horizontally.
   2. Make end laps of lath only over supports and stagger endlaps in adjacent courses.
   3. Wrap metal lath a minimum of 16 inches around all inside and outside corners.

3.05 BROWN COAT APPLICATION FOR THIN BRICK VENEER

A. Apply scratch coat with sufficient pressure so that it is forced through the metal reinforcement and against the backing to form full keys and to embed reinforcement completely. Apply to an approximate thickness of 3/8 inch from the face of the backing. Scratch to provide bond for succeeding coat.

B. Apply brown coat not sooner than 48 hours after the application of the scratch coat. Dampen scratch coat evenly to obtain uniform suction. Apply to an approximate thickness of 3/8 inch. Bring surface to a true, even surface by floating or rodding and leave rough, ready to receive thin brick veneer.

C. Temperature shall be 45 degrees F. and rising during application and for 48 hours thereafter.

D. Allow brown coat to dry overnight before applying thin brick.

3.06 EXPANSION AND CONTROL JOINTS

A. Existing joints in substrate must be carried through the brick work and must conform to architectural details. Expansion joints must be installed where bricks abut restraining surfaces, such as perimeter walls, curbs, columns, corners, etc. Expansion joints must be installed at all "changes of plane" in the brick work. Refer to Tile Council of North America (TCNA) Detail EJ-171 (Current Year) for industry recommendations. Use LATICRETE Latasil Sealant for all such joints.

3.07 INSTALLATION OF WATERPROOFING AND CRACK SUPPRESSION MEMBRANE

A. Install LATICRETE Air & Water Barrier membrane in all wet areas and exterior areas prior to installing thin brick veneer.

B. Use LATICRETE Air & Water Barrier as the anti-fracture membrane over all hairline cracks (≤ 1/8” or 3mm) in surfaces, prior to installing thin brick veneer. Refer to LATICRETE data sheets 663.0 and 663.5 for complete installation instructions.

C. Use LATAPOXY® Waterproof Flashing Mortar to waterproof seams, gaps or joints adjacent to metal and PVC pipe penetrations and flashings. Refer to LATICRETE data sheet 070.0 for complete installation instructions.

3.08 APPLICATION OF THIN BRICK VENEER

A. Erect thin brick panel system in accordance with manufacturer’s written installation instructions.
   1. Wall Veneer Installation Methods: Thin-Set Latex Portland Cement Mortar; TCA W-243.
   2. Application of Masonry Veneer Mortar for Thin Brick:
      a. Apply Masonry Veneer Mortar to the substrate with scraping motion, using the flat side of a notched trowel.
      b. Work the mortar into good contact with the substrate. A trowel with notches large enough to ensure full mortar coverage to the backs of the brick veneer is required. Using the notched side, trowel Masonry Veneer Mortar in one direction.
      c. Back-butter each brick veneer piece with a thin layer of mortar.

d. Firmly press brick veneer pieces into the freshly applied LATICRETE Masonry Veneer Mortar and move them perpendicularly across the ridges to flatten and compress the ridges. This helps to produce maximum coverage to the backs of the bricks.
e. Do not apply more Masonry Veneer Mortar than can be covered while the mortar is still wet and tacky.
f. Periodically, remove and check brick veneer pieces to verify full mortar coverage is being achieved.
g. Allow veneer installations to set for 12 to 24 hours at 70° F (21° C) prior to pointing joints between pieces.
h. Excess veneer mortar must be cleaned from the surface of the bricks with a clean, wet cloth or sponge, while it is still fresh.
i. Brick veneer must be supported until Masonry Veneer Mortar has set firm; typically, 12 to 24 hours at 70° F (21° C).

2. Start installation of thin brick from the bottom up, or as otherwise recommended by the manufacturer.
3. Apply corner units first, alternating short and long legs of each course.
4. Provide exterior thin brick corners at all exterior corners. Miter joints occurring at exterior corners are not acceptable.
5. Except where other special coursing is indicated on the Drawings, install brick veneer in running bond pattern
6. Place units with uniform mortar joints of nominal 3/8 inch and not exceeding 1/2 inch in width.
7. Utilize wire ties where required to secure units in position until mortar has set.

B. Pointing of Joints:
1. A high quality masonry mortar pointing bag shall be used to fill joints.
2. Carefully bag the pointing mortar into the joints.
3. Install Masonry Pointing Mortar after allowing the installation to cure for 12 to 24 hours at 70 degrees F (21 degrees C).
4. Prior to pointing, apply a grout release or sealer to the faces of the brick veneer, if necessary.
5. Remove all spacers and debris in joints as well as dust and dirt using a damp sponge.
6. Dampen brick surface with water.
7. Once the mortar has become stiff in the joint, (“thumb-print dry”) typically 15-20 minutes after pointing at 70 degrees F, using a striking or joint tool, strike the mortar to a concave contour.
8. Remove excess mortar using a masonry brush or sponge. Do not over wash the mortar joint.

C. Do not lay chipped, cracked, or otherwise defective units in the wall where damaged portion or non-integral colored portion of thin brick will be exposed to view. Units that are cut in field and therefore expose non-integrally colored portions of unit shall only be used where exposed edge can be completed concealed in the finished work. Units installed with non-integrally colored portions exposed in the Work shall be considered defective. Remove and replace units that chipped, cracked, broken, or otherwise defective whether before or after setting.

D. Openings: Provide openings in thin brick walls where required or indicated. Steel lintels shall be provided unless otherwise noted.

E. Cutting of Thin brick: Plan work to minimize jobsite cutting. When required, exposed units shall be cut with a power driven Carborundum or diamond disc blade saw to provide uniform edges. When using "wet" cutting methods, clean water shall be used on exposed units.
1. Lay units with cut edges so cut edge is concealed in finished work.

F. Where fresh thin brick joins thin brick that is partially or totally set, the exposed surface of the set thin brick shall be cleaned and lightly wetted so as to obtain the best possible bond with the new Work. Loose thin brick and mortar shall be removed.

G. Apply sealer to exposed surfaces of thin brick in accordance with Section 07 19 00 – Water Repellent

H. Coordinate sealant application as specified in Section 07 92 00 as detailed and as required to maintain waterproof integrity.

3.09 TOLERANCES

A. Positioning of Elements: Maximum 1/4 inch from true position.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet.

C. Maximum Variation Between Face Plane of Adjacent Panels: 1/16 inch.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; ½ inch maximum.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.10 REPAIRS OF THIN BRICK VENEER

A. Remove and replace thin brick which has cracks, blisters, pitting, discoloration or other defects.

B. Repairing of defects will be permitted only when approved by the Architect and Resident Engineer.

C. Repairs shall match existing work.

3.11 CLEANING OF THIN BRICK VENEER

A. Daily Cleaning:
1. Keep walls clean.
2. Soiled thin brick from mortar spills which will be exposed to view at the completion of the Project shall be cleaned immediately with stiff fiber brushes until the wall is free of dropped or spattered mortar.

B. Final cleaning:
1. Clean soiled surfaced with cleaning solution as recommended by manufacturer.
2. Use only non-metallic tools in cleaning operation.

C. Remove scaffolding and equipment used in the Work.

D. Clean up debris, refuse and surplus material and remove from premises.

E. Construction Waste: In accordance with Section 01 74 19.

3.12 PROTECTION OF THIN BRICK VENEER

A. Furnish temporary protection for exposed thin brick corners subject to injury.

B. Carefully cover tops of walls left incomplete at the conclusion of the day's work with tarpaulins or other approved covering, securely held in place.

C. In hot and dry weather, protect thin brick against too rapid drying.

D. Protect finished work against freezing for a period of not less than 48 hours by means of enclosures, artificial heat, or such other protective methods as may be required.

E. Allow no construction activity on opposite side of wall to which thin brick work is being applied during and for 48 hours after completion of work.

END OF SECTION

SECTION 04 22 00

CONCRETE MASONRY UNITS

PART 1 GENERAL

1.01 SUBMITTALS

A. Samples: If concrete masonry units are to be exposed to view in the final construction, submit samples to Resident Engineer for review prior to constructing job-site mock-ups, delivering materials to Site or commencing Work in this Section.
   1. Provide 2 samples of each type and weight classification of concrete masonry units, (stretcher units), to be used on Project showing range of texture and/or color variations of exposed surfaces for units.
   2. Samples of burnished and split faced finishes shall be provided at manufacturing facility and shall be approved prior to manufacturing of units to be provided for the project.
   3. Units provided to Project shall match these samples.

B. Certificates: Submit certification to the Resident Engineer prior to delivery of concrete masonry units to jobsite, signed by Concrete Masonry Unit Manufacturer, stating that the concrete masonry units to be supplied: 1) shall meet the specified requirements for concrete masonry units for exterior building wall construction, and; 2) are suitable for proposed usage.

C. Test Reports:
   1. Submit test results for concrete masonry units for exterior building wall construction to be used to Resident Engineer in accordance with Section 01 45 00.
   2. Test results shall clearly indicate:
      a. Types of materials and composition.
      b. Classification of concrete masonry unit in accordance with ASTM C90 requirements.
      c. Water penetration and leakage in accordance with testing specified under Source Quality Control specified in this section.
   3. Testing laboratory shall notify Resident Engineer of non-conforming material submittals.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 QUALITY ASSURANCE

A. Standards: Comply with the requirements of ACI 530.1/ASCE 6 "Specifications for Masonry Structures", except as otherwise indicated.

B. Regulatory Requirements: Masonry materials and workmanship shall meet requirements of building codes which are applicable to jurisdiction in which Project is located.

C. Mock-Ups: If concrete masonry units are to be exposed to view in the final construction, prior to start of Work, construct a sample panel from approved materials, containing each different kind or color of concrete masonry units, approximately 4 feet high x 6 feet long or as required to illustrate wall design under direction of Resident Engineer. Sample wall shall not be incorporated into the final work.
   1. Sample wall shall provide a standard of workmanship, bond, thickness, tooling of joints and finishes (precision, burnished and split face).
   2. Construct successive sample panels until standard is approved.
   3. When accepted, sample wall shall be standard of comparison for remainder of masonry Work.
   4. This sample, when accepted by the Resident Engineer, will function as a reference base for acceptance or rejection of final work.
   5. Sample wall shall be reviewed by the Resident Engineer for acceptance.
   6. Upon completion of Project, remove sample wall from site and dispose of in a legal manner.

1.03 DELIVERY, STORAGE AND HANDLING

A. Transport and handle masonry units in such a manner as to prevent chipping and breakage.

B. Deliver and store materials in dry, protected areas.

C. Keep free of stain or other damage.

D. Locate storage piles, pallets, stacks or bins to avoid or protect material from heavy or unnecessary traffic.

E. Replace damaged material at no cost to Owner.

1.04 PROJECT/SITE CONDITIONS

A. Hot Weather Requirements:
   1. When ambient air temperature exceeds 100 degrees F., or when ambient air temperature exceeds 90 degrees F. and wind velocity is greater than 8 mph, Masonry Contractor shall implement hot weather protection procedures as submitted to Resident Engineer.
   2. Do not spread mortar beds more than 4 feet ahead of placing block units.
   3. Place block units within one minute of spreading mortar.

B. Cold Weather Requirements:
   1. Fully protect concrete masonry units against freezing by a weather-tight covering which shall also prevent accumulation of ice.
   2. Do not lay concrete masonry units when temperature of surrounding atmosphere is below 40 degrees F. or is likely to fall below 40 degrees F. in the 24 hour period after laying, unless adequate protection is provided.

C. Field Measurements:
   1. Verify measurements shown on Drawings by taking field measurements.
   2. Proper fit and attachment of concrete masonry units is required.

1.05 SCHEDULING AND SEQUENCING

A. Coordination: Coordinate with other Trades whose Work relates to concrete masonry unit installation for placing required blocking, backing, furring, conduits and other items.

PART 2 PRODUCTS

2.01 MATERIALS

A. General Requirements for Concrete Masonry Units:
1. CMU shall comply with the requirements of the Structural Notes on the structural drawings.
2. Concrete masonry units shall meet ASTM C90 requirements except that when CMU will be exposed in final construction, ASTM C90 shall be modified to read: "Three percent of a shipment containing chips not larger than 1/2 inch in any dimension, or cracks not wider than 0.02 in. and not longer than 10% of the nominal height of the unit is permitted." Linear shrinkage of units of units shall not exceed 0.065 percent.
3. Units shall be in the same condition in wall as they were upon delivery.
4. Unit sizes shall be as shown on Drawings.
5. Texture and color shall be consistent for all units provided for exposed walls. Range of texture and color shall be within that shown by samples and mockups reviewed by Resident Engineer.
   a. Color: Exposed faces of CMU to be yellow gold color with red and black cinders with appropriate recycled content for both building and fencing.
   b. Building Exterior Surface for public view:
      1) Burnished at exterior with precision finish interior
      2) Basis of Design: Regalstone block as manufactured by RCP Block and Brick www.rcpblock.com or equal.
      3) Exterior surface exposed to view shall have burnished finish on 1, 2 or 3 faces as required by the design.
   c. Fence Exterior Surface for public view:
      1) Split faced with precision finish toward private yard.
      2) Exterior surface exposed to view shall have split on 1, 2 or 3 faces as required by the design.
6. Surface of units shall be clean and free from dirt when laid in walls.
7. Units not complying with the appropriate ASTM Standards shall not be laid in the wall where exposed to view. Any unit that is chipped in excess of the requirements will be rejected and shall be removed and replaced.
8. Provide special block sizes and shapes required or as shown on Drawings.
9. CMU may be used for construction of building walls exposed to the exterior if they comply with requirements specified under Source Quality Control.
10. Provide units of uniform color and appearance where the completed CMU wall is indicated to be provided with water repellent specified in Section 07 19 00 or which will receive anti-graffiti coatings as specified in Section 09 96 23.
11. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
12. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Hollow CMU Classifications: The following requirements shall apply to all shapes, colors, textures and sizes of CMU provided.
1. Lightweight units:
   a. Weighing less than 105 lbs. per cubic foot and manufactured from volcanic scoria aggregate per ASTM C331.
   b. These units shall not be used for exterior construction exposed to weather unless they comply with the requirements specified under Source Quality Control, and if they receive a water repellent coating as specified in Section 07 19 00 (when approved by water repellent manufacturer).

2. Medium weight units:
   a. Weighing 105 lbs. per cubic foot to less than 125 lbs. per cubic foot and manufactured from a combination of volcanic scoria aggregate conforming to ASTM C331 and sand conforming to ASTM C33.
   b. These units may be used for exterior construction in an exposed condition:
      1) If they comply with the requirements specified under Source Quality Control
      2) If they receive a water repellent coating as specified in Section 07 19 00 (when approved by water repellent manufacturer), or; if a finish such as stucco or elastomeric paint will be applied or using an integral water repellent (when approved by integral water repellent manufacturer).
3. Normal weight units:
   a. Weighing 125 lbs. per cubic foot or more and manufactured with sand conforming to ASTM C33.
   b. These units may be used for exterior construction in an exposed condition:
      1) If they comply with the requirements specified under Source Quality Control
      2) If they receive a water repellent coating as specified in Section 07 19 00 (when approved by water repellent manufacturer), or; if a finish such as stucco or elastomeric paint will be applied or using an integral water repellent (when approved by integral water repellent manufacturer).

C. Accessory Units: Provide units as required for window sills and jambs, doors, control joints, bond beams, lintels, pilaster, caps and other locations as indicated on Drawings with a minimum of block cutting. Accessory units shall match adjacent unit color and texture unless noted otherwise.

2.03 ACCESSORIES

A. Joint Reinforcing: In accordance with Section 04 05 23 and Structural Notes.

B. Reinforcing Steel: As specified under Section 03 20 00.

C. Control Joints:
1. Rubber: Extruded, solid section, ASTM D2000 2AA-805 with a durometer hardness of 70 or 80 when tested per ASTM D2240.
2. Polyvinyl Chloride (PVC): ASTM D2287, Type PVC 654-4 with a durometer hardness of 85 (+5) when tested per ASTM D2240, minimum tensile strength of 1750 psi with minimum 300 percent elongation per ASTM D638, and cold crack brittleness of 50 degrees F per ASTM D746.
3. Sizes and Profiles: As indicated on Drawings.

D. Mortar and Grout: As specified under Section 04 05 15.

E. Nailing Strips: See Section 06 10 53 – Miscellaneous Carpentry.

F. Sheet Metal Flashings: See Section 07 60 00. Furnish shapes in accordance with project requirements and NCMA TEK 19-2A, 19-4A and 19-5A.

G. Steel Lintels: As indicated or scheduled on Structural Drawings.

2.04 SOURCE QUALITY CONTROL

A. Concrete masonry units to be provided for exterior exposed building wall construction shall be tested by manufacturer using a spray bar test as follows:
1. Testing shall be performed at no additional cost to Owner.
2. Individual concrete masonry units shall be placed on a rack where water is sprayed at a rate of 140 gallons per hour for a minimum of 4 hours.
3. Testing shall be made upon concrete masonry units prior to application of post-applied water repellent.
4. Test results for units regularly manufactured using a standard mix design within the previous 6 months shall be acceptable.
5. Test results shall meet or exceed the following:

Location	Results
Inside front face shell	<20% damp (no running water or sheen)
Center web	Dry
Inside outer web	<10% damp
Inside of back face shell	Dry
Outside of back face shell	Dry

6. Submit test reports as specified herein under "Submittals."

PART 3 EXECUTION

3.01 EXAMINATION

A. Installer shall examine supporting structure and conditions under which unit masonry is to be installed, and notify Contractor, in writing, conditions detrimental to proper and timely completion of Work. Do not proceed with the installation of unit masonry Work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

B. Do not use units with chips, cracks, or other defects which might be visible in the finished Work unless otherwise acceptable to the Resident Engineer.

C. Do not build on frozen Work; remove and replace unit masonry Work damaged by frost or freezing.

D. Do not use frozen materials or materials mixed or coated with ice or frost. Do not lower freezing point of mortar by use of admixtures or anti-freeze agents, and do not use calcium chloride in mortar or grout.

3.02 PREPARATION

A. Protection: Protect sills, ledges, offsets and other projections from dropping of mortar and grout.

3.03 ERECTION, INSTALLATION, APPLICATION

A. General Requirements for Concrete Masonry Walls:
1. Workmanship: Concrete masonry units which will be exposed in the finished work shall be treated as an architectural finish and shall be handled carefully to ensure that chippages do not occur during handling and laying. Handling shall be minimized on the jobsite to eliminate chances for chippage.

2. Lay units in uniform and true courses, level and plumb to height indicated on Drawings.
3. Lay concrete unit masonry in such a way that cracks are not formed at time unit is placed in wall.
4. Units shall not be wetted before being used and shall be laid dry.
5. Adjusting Units:
   a. Units shall be adjusted to be level, plumb and straightened into final position in wall while mortar is still soft and plastic enough to ensure a good bond.
   b. Avoid over-plumbing and pounding of corners and jambs to fit stretcher units after they are set in position.
   c. If position of unit is shifted after mortar has stiffened, or bond is broken or cracks are formed, re-lay unit in new mortar.
6. Bearings on Walls: Provide 3 courses of solid units or grouted hollow masonry units below steel bearing plates or beams bearing on walls. Extend bearings each side of contact with load as required to properly transfer loads into wall.
7. Openings: Provide openings in masonry walls where required or indicated. Steel lintels shall be provided unless otherwise noted.
8. Cutting of masonry: When required, exposed block units shall be cut with a power driven Carborundum or diamond disc blade saw. When using "wet" cutting methods, clean water shall be used on exposed units.

B. Bonding:
1. Bond pattern shall be regular running bond unless indicated otherwise on the drawings.
2. Bond shall be plumb throughout face of wall.

C. Bearing Wall Intersections:
1. Intersecting block bearing walls shall not be tied together in a masonry bond, except at corners.
2. One wall shall terminate at face of other wall with a control joint at intersection.
3. Tie intersecting wall together with a metal tie bar, 1/4 inch x 1-1/4 inches x 2'-4" long with a 2 inch right angle bend at each end of bar, spaced vertically at 2 feet on center.
4. Bends at ends of tie bars shall be embedded in grouted cells.
5. Rake out vertical joint between intersecting walls to a depth of 3/4 inch after mortar has stiffened.
6. Provide sealing of control joint as specified in Section 07 92 00.

D. Non-Bearing Wall Intersections:
1. Tie non-bearing wall together with strips of metal lath or galvanized 1/4 inch mesh hardware cloth placed across joint between 2 walls placed in alternate horizontal block courses.
2. Rake out vertical joint between intersecting walls to a depth of 3/4 inch after mortar has stiffened.
3. Provide sealing of control joint as specified in Section 07 92 00.

E. Joining of Work:
1. Where fresh masonry joins partially set masonry the exposed surface of the set masonry shall be cleaned and lightly wetted so as to obtain the best possible bond.
2. Remove loose concrete block and mortar.
3. Stop-off a horizontal run of masonry by racking back 1/2 brick length in each course and, if grout is used, stopping the grout 4 inches back of the rack.
4. Toothing will not be permitted, except upon written approval of the Resident Engineer.

F. Mortar Joints:
1. Joints shall be straight, clean and a uniform 3/8 inch thickness on exposed wall face and in accordance with NCMA TEK 19-2A.
2. Exposed vertical and horizontal joints shall be tooled when mortar is “thumbprint” hard with round or other approved jointer, slightly larger than the width of the joints to produce a dense, slightly concave or "V" tooled surface (as indicated on Drawings) which is well bonded to block at edges. Raked joints shall not be used on single wythe exterior building wall construction.
3. Joints shall be tooled flush at:
   a. Below grade and planter surfaces to receive dampproofing or waterproofing,
   b. Interior or exterior surfaces to receive ceramic tile, stucco, plaster or other finishes requiring flush joints that are to be concealed.
4. Solidly fill joints from face of unit to depth of face shell, except where specified otherwise.
5. Full bedding to be provided for first course on foundation and wherever maximum strength is required.
6. Butter vertical head joints well and shove these joints tight so that mortar bonds well to both units.
7. Full coverage to be provided on bed of face shells and webs surrounding cells to be filled.
8. Bee-holes or other open joints shall be filled and tooled with mortar while mortar is still fresh.

G. Control Joints:
1. Provide control joints, as detailed, at vertical masonry walls where such walls exceed 40 feet in length. In long length of walls, provide joints at approximately 24 feet on center or as detailed.
2. Control joints shall be continuous full height of walls.
3. At bond beams, control joints shall separate both block and grout; however, steel reinforcing shall be continuous.
4. Horizontal wire reinforcing shall not run through control joint.
5. Control joints shall not occur at wall corners, intersections, ends, within 24 inches of concentrated points of bearing or jambs or over openings unless specifically indicated on Structural Drawings.
6. Control joint materials shall be held back from finished surface as required to allow for sealant and back-up materials.

H. Horizontal Joint Reinforcing:
1. Place horizontal joint reinforcing every 16 inches vertically throughout wall construction.
2. Continuously reinforce first bed joint immediately above and below openings. Provide reinforcing in second bed joint above and below openings which extends 2 feet beyond each side of opening.
3. Lap reinforcement a minimum of 6 inches at splices.
4. Cut and bend reinforcing at corners.

I. Vertical Reinforcing and Bond Beam Reinforcing: As indicated on Structural Drawings.

J. Grouting:
1. Reinforcing steel is to be in place and inspected before grouting starts.
2. Vertical cells to be filled shall have vertical alignment to maintain a continuous cell area.
3. Keep cell to be grouted free from mortar.
4. Fill cells solidly with grout in lifts not to exceed 4 feet.

5. Grout may be poured by hand bucket, concrete hopper or through a grout pump.
6. Do not wet down grout space prior to pouring of grout.
7. Stop pours 1-1/2 inches below top of cell to form a key at pour points.
8. Grout shall be consolidated by mechanical vibration during placing before loss of plasticity in a manner to fill grout space. Grout pours greater than 12 inches shall be reconsolidated by mechanical vibration to minimize voids due to water loss. Grout pours 12 inches or less in height shall be mechanically vibrated, or rodded.
9. Grout barrier below bond beams shall be continuous wire lath or other approved material.
10. Grout beams over openings and bond beams in a continuous operation.
11. Solidly grout in place bolts, anchors and other items within wall construction.
12. Fully grout jambs and head of metal door frames connected to masonry. Filling of frames shall be done as each 2 feet of masonry is laid.
13. Use extreme care to prevent grout or mortar from staining face of the masonry.
14. Immediately remove grout or mortar which is visible on face of masonry.

K. Provisions for Other Trades and Built-in Items:
1. Build in items required and indicated, including; but not limited to, reinforcing steel, anchors, flashings, sleeves, frames, structural steel, loose lintels, anchor bolts, nailing blocks, door and window frames and miscellaneous iron.
2. Enclosures for pipes, stacks, ducts and conduits:
   a. Construct slots, chases, cavities, and similar spaces as required.
   b. Where masonry is to enclose conduit or piping, bring it to proper level indicated and as directed.
   c. Cover no pipe, conduit chases or enclosures until advised that Work has been inspected and approved.

L. Tolerances - Standard Level of Quality:
1. External corners and other conspicuous lines and levels: +/- 1/2 inch in any 10'-0" section.
2. Line of sealant filled movement joints (allowable deviation from specified or indicated): +/- 1/2 inch in any 10'-0" section.
3. Actual cross sectional dimension of columns and walls (allowable deviation from specified or indicated): - 3/8 inch, + 3/4 inch.
4. Adjacent unit faces in plane (allowable deviation from specified or indicated): +/- 3/16 inch.
5. Mortar bed joint thickness (allowable deviation from specified or indicated): -1/8 inch, +1/4 inch.
6. Mortar head joint thickness (allowable deviation from specified or indicated): - 1/4 inch, + 3/8 inch.
7. Vertical alignment of the centerline of corresponding head joints in alternate courses when using other than stack bond (allowable deviation from specified or indicated): +/- 5/8 inch.
8. Vertical alignment of the centerline of all head joints in a total wall height not to exceed 30'-0" when using other than stack bond (allowable deviation from specified or indicated): +/- 2 inches.
9. Vertical alignment of the centerline of all head joints in total wall height not to exceed 30'-0" when using stack bond: (allowable deviation from specified or indicated): +/- one inch.

M. Joint and Crack Control: In accordance with NCMA TEK 10-1.

N. Flashing: In accordance with NCMA TEK 19-2A, 19-4A and 19-5A.and 19-4.

O. Weep holes shall be provided above lintels and vertical obstructions as per manufacturer's flashing and weep hole diagrams.

3.04 FIELD QUALITY CONTROL

A. Masonry Tests: Inspection and testing of masonry will be performed by a testing laboratory in accordance with Section 01 45 00.
1. Provide free access to Work and cooperate with appointed firm.
2. A set of 3 masonry prisms shall be built and tested in accordance with ASTM C1314 (formerly E447) Method B for each 5,000 square feet of wall area, but not less than one set of 3 masonry prisms for the Project.
3. Water testing of CMU exterior building walls shall be provided as specified in Section 07 19 00.

3.05 ADJUSTING

A. Pointing of Mortar Joints:
1. Point and fill holes and cracks in exposed mortar joints.
2. Cut out defective mortar joints to a depth of at least 1/4 inch.
3. When cutting is complete, remove dust and loose material by brushing or vacuuming.
4. Prehydrate mortar for pointing by mixing dry ingredients with only sufficient water to produce a damp mass of such consistency that it will retain its form when it is pressed into a ball with hands, but will not flow under trowel.
5. Allow mortar to stand for a period of not less than one hour nor more than 2 hours, after which remix with addition of sufficient water to produce satisfactory workability.
6. Pointing mortars shall be identical to adjacent mortar in similar joints and finish results shall match and be indistinguishable from original mortar used.
7. Premoisten joint and apply mortar tightly.
8. Tool to match adjacent joints.
9. Moist cure for 72 hours.

B. Patching: If approved by Resident Engineer, patching of exposed masonry walls shall be done at conclusion of general Work and shall conform as closely as possible to similar surrounding or adjoining Work.

3.06 CLEANING

A. Daily Cleaning: Keep walls clean. Soiled masonry from mortar and grout spills which will be exposed to view at completion of Project shall be cleaned immediately with stiff fiber brushes until wall is free of dropped or spattered mortar.

B. Remove scaffolding and equipment used in Work.

C. Clean up debris, refuse and surplus material and remove from premises.

D. Construction Waste: In accordance with Section 01 74 19.

E. Storm Water Control: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

F. Environment Protection: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

3.07 PROTECTION

A. Furnish temporary protection for exposed masonry corners subject to injury.

B. Carefully cover tops of walls left incomplete at conclusion of day's Work with tarpaulins or other approved covering.

C. In hot and dry weather, protect masonry against too rapid drying.

D. Protect finished Work against freezing for a period of not less than 48 hours by means of enclosures, artificial heat, or such other protective methods as may be required.

END OF SECTION

SECTION 05 10 00

STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Structural steel framing including, but not limited to:
1. Columns
2. Beams
3. Lintels
4. Anchor Bolts
5. Bearing Plates,
6. Miscellaneous Structural steel items.

B. Work performed under this section shall also comply with the requirements of the Structural Notes on the structural drawings.

1.02 SUBMITTALS

A. Shop Drawings: Submit shop and erection Drawings clearly showing each piece required for fabrication and erection. Drawings shall include material grade, camber, holes and other pertinent data. Indicate welds by standard AWS symbols showing size, length, and type of each weld.

B. Test Reports: Submit reports for welded connection tests.

C. Submit anchor setting drawings clearly showing location of all anchor bolts and embedded plates to be anchored in concrete and masonry construction. Provide templates for anchor bolts.

D. Product Data Form:
1. In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.
2. In addition to the Products Forms required by Section 01 33 00, provide the following LEED information for structural metal framing:
   a. Section IV – Materials and Resources (MR) Credit Contribution
      1) MR Credit 4.0 – Recycled Content
         a) Post Consumer (%)
         b) Post Industrial (%)
      2) MR Credit 5.0 – Local / Regional
         a) Manufacturing Location and Distance to Jobsite
         b) Raw Material Harvest/Extration Location and Distance to Jobsite
   b. Section V – Indoor Environmental Quality (EQ) Credit Contribution
      1) EQ Credit 4.2 – Paints and Coatings (Touch up primers used on steel installed in place which is exposed to interior)
         a) Non-Flat (VOC Content) (As applicable to primer)
         b) Flat (VOC Content) (As applicable to primer)
3. Other information requested on LEED™ Credit Contribution Sheet (e.g. EQ Credit 4.1 – Adhesives and Sealants) is not applicable and is to be left blank.

1.03 QUALITY ASSURANCE

A. Welding:
1. Performed by certified welders in compliance with AWS D.1 Structural Welding Code.
2. Welders shall be duly qualified within the last 12 months in the position in which they are to weld and the qualifications and Specifications for workmanship shall comply with the AWS requirements "AWS Structural Welding Code - Steel."

B. Certifications:
1. Prior to fabrication or shipment of material to the job site, furnish certification of the Manufacturer of the structural steel that material furnished meets or exceeds requirements of ASTM standards specified or noted on Drawings, for each type of material.
2. Prior to site welding operation, submit welders' written certifications and qualifications.

C. Tolerances: All steel exposed to view shall be architectural steel, and tolerances as a minimum shall comply with section 10 of AISC code of standard practice.

1.04 DELIVERY, STORAGE AND HANDLING

A. Exercise care during unloading, storage and erection to avoid damage. Dumping on the ground is not permitted.

B. Support material stored at the site completely free of the ground, and cover to avoid damage from the elements.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Materials shall be new, of uniform quality, suitable and without defects affecting the strength or service of the structure.
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Structural Steel: ASTM A992 (Fy = 50ksi), except angles, channels and plates shall be ASTM A36 (Fy = 36ksi).

C. Steel Pipe Columns: ASTM A53 Grade B (Fy = 35,000 psi).

D. Steel Tube Columns (HSS shapes – Box or Round): ASTM A500, Grade B (Fy = 46,000 psi).

E. Bolts:
1. Machine Bolts: ASTM A307, unless otherwise indicated.
2. High Strength Bolts: ASTM A325.

F. Welded Anchors and Shear Connectors: ICC approved, as manufactured by KSM, Nelson or equal..

G. Welding Rods: AWS A5.0, E70 series, low hydrogen type.

H. Metal Primer: VOC compliant.
1. Interior Steel:
a. Zinc oxide, alkyd primer, high-solids content, conforming to SSPC-Paint 25.1.
b. Primer used within the interior of the building shall be in accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.
2. Exterior Steel (exposed): 2-component, moisture-cured zinc-rich primer conforming to SSPC-PS 12.01.

2.02 FABRICATION

A. Workmanship and details of construction (except as otherwise indicated or specified) shall be in conformity with applicable articles of the latest AISC Manual, Parts 1 through 4; AISC Specifications; except Section A7 (Design Documents) and Chapter N (Plastic Design); and the applicable building codes. Sections 3.1, 3.4 and 4.2 of AISC code of Standard Practice are specifically excluded from this work.
1. Sections shall be of dimensions, weight and design as indicated, assembled complete at the shop, with base plates and other detailed materials attached.
2. Furnish 1/4 inch thick leveling plates at columns where base plates are shop fabricated to columns.
3. Make connections as indicated or detailed, on the Drawings and the reviewed shop and erection Drawings.
4. Exposed steel shall have smooth, clean surfaces with no identifying trade marks, names etc., exposed to view.
5. Leave in condition for finish painting.

B. Bolted connections shall be as detailed or shall conform to AISC standard bolted connections with maximum number of 3/4-inch diameter bolts. See Framed Beam Connections Tables II, III, or IV of AISC Manual of Steel Construction.

C. No slotted holes permitted at steel connections unless shown on Drawings or approved by Structural Engineer.

D. Where bolt holes in steel members are enlarged to more than 1/16 inch diameter oversize, provide 3/16 inch x 2-1/2 inch x 2-1/2 inch plate washers to steel members with 3/16 inch fillet weld all around.

E. Loose Steel Lintels: Provide loose structural steel shape lintels for openings and recesses in masonry walls and partitions, as shown. Weld adjoining members together to form a single unit. Provide not less than 4 inch bearing at each side of openings, unless otherwise shown.

F. Loose Bearing Plates: Provide loose bearing plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.

2.03 SHOP FABRICATION FOR USE OF HIGH STRENGTH BOLTS

A. Joint surfaces, including those adjacent to the bolt heads, nuts or washers, shall be free of loose mill scale, burrs, or any foreign material (including paint). Field paint these areas with the specific shop paint after erection and completion.

B. Joints using high strength bolts shall be inspected by a representative of an independent testing laboratory acceptable to the Owner's Representative.
   1. Inspection shall be accomplished by the use of a properly calibrated torque wrench.
   2. Calibration shall be by the procedure specified in the Specifications for structural joints using ASTM A325 or A490 bolts, under Section 9, inspections (pp. 6-276) Ninth Edition, AISC Manual of Steel Construction.
   3. Check a minimum of 20 percent of the bolts in each connection.
   4. If one or more of the bolts checked in any connection is below the minimum tension, check all of the bolts in that connection.
   5. Bolts which cannot be properly tensioned will be rejected.

C. Check calibrated wrenches individually for accuracy at least once daily for actual conditions of application.

D. The Inspector shall check to insure that bolt threads are eliminated from the shear planes. Submit copies of the torque reading for each connection directly to the Architect and Resident Engineer in the form of a report, along with the minimum torque values required to reach the specified tensions and the calibration procedures.

E. The use of load indicator washers or twist-off spline type of fastener requires specific prior approval of the Architect and Resident Engineer.

2.04 SHOP WELDING

A. Make welds by the electric-arc process.

B. Grind exposed welds smooth.

C. Where weld size is not indicated, it shall develop full strength of member and connection.

2.05 PAINTING - SHOP COAT

A. Items of steel and iron Work indicated or specified to be encased in concrete shall not be painted.

B. Clean steel Work by wire brushing, or by other means selected by the fabricator, of loose mill scale, loose rust, accessible weld slag, or flux deposit, dirt and other matter. Remove oil and grease deposits by solvent. Solvents used shall be low toxic and meet the standards of Section 01 60 00.

C. After cleaning, give steel Work one coat of metal primer.
   1. Apply primer thoroughly and evenly to dry surfaces by brush, spray, roller coating, flow coating or dipping at the selection of the fabricator.
   2. See also Section 09 91 00 for requirements regarding paints for compliance with LEED™ requirements.

D. Apply primer at a rate of 350 sq. ft. per gallon to provide a wet film of 4.5 mils.

E. Paint erection marks on painted surfaces. Touch-up surfaces where welding, grinding of welds, joints, etc. are done in the field.

F. The paint shall be thoroughly dry before the members are handled or loaded.

2.06 SOURCE QUALITY CONTROL

A. Tests: Where a welded splice is fabricated in beams or columns other than those detailed, fabricator shall have splice connection tested using one of the following methods: magnetic particle, radiographic, or ultrasonic. Testing shall be conducted by an independent testing laboratory and a report submitted to the Architect and Resident Engineer. The costs of this testing shall be borne by the fabricator.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
1. Verify anchor bolt locations, grouting and elevation of base and setting plates, and other material set by other Trades before commencing Work.
2. Notify Architect and Resident Engineer of Work set by others which does not comply with specified tolerances. Do not erect material upon such Work until it has been satisfactorily corrected.
3. Start of Work implies acceptance of Work of other Trades affecting structural frame erection.

3.02 ERECTION

A. Erect Work to the proper lines and levels, plumb and true, and in correct relation to other Work maintain this condition to completion.

B. Connections:
1. Machine Bolting:
   a. Fair-up holes with pins to align holes before bolting.
   b. Ream unfair holes to obtain alignment or drill new holes.
   c. Enlargement of holes with drift pins or burning of new holes is not permitted.
   d. Draw bolts up tight after members are aligned and leveled, and set or deform threads to prevent loosening.
2. Welding:
   a. Weld by shielding arc method per AWS standard code for arc and gas welding in building construction.
   b. Submit certification that welders have passed AWS code qualification tests.
   c. Refer to Shop Drawings for weld size and dimensions.
   d. Close joints exposed to weathering with continuous 1/8 inch weather welds.
   e. Grind smooth exposed welds, but grinding shall not reduce weld strength or required cross section.
   f. Protect finish material from damage due to welding.
   g. Remove unsatisfactory welds by chipping or arc air method.
3. Connect members temporarily and align completely before making permanent connections.
   a. Temporary conditions shall consist of bolts in no less than 1/3 of the holes and in no case less than 3 bolts in any single connection.
   b. Surfaces in contact shall be thoroughly clean when assembled.
   c. Provide necessary temporary bracing and guying to align the structure properly for permanent connections, and safely resist erection, dead load and wind stress.

d. Take particular care to have the Work plumb and level (maximum slope ratio tolerance 1 to 500 for interior members, 0 to 1000 for exterior members) before making permanent connections.

e. Remove bracing and guys only after permanent alignment and assembly and structure is capable of completely sustaining design and temporary construction loads.

C. Exposed Steel:

1. Verify the condition of exposed steel after erection.
2. Exert particular care to provide a neat, accurate installation with members straight and true, corners and edges square, sharp and free from burrs and irregularities, adjacent members perfectly matched and no bolts or rivets exposed.
3. Remove erection bolts and seats and plug weld and grind holes smooth.

D. Touch-up Painting:

1. Remove temporary guys, bracing and bracing clips, and grind flush remaining burrs, before painting. Remove welding slag, spatter, rust and burnt paint and wire brush clean welds before touch-up.
2. Touch-up Painting: Touch-up welds, abrasions, bolted connections, and other areas where shop prime paint has been removed or is damaged with specified prime paint or galvanizing repair paint.

3.03 CLEANING

A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 05 31 00

STEEL DECK

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Design Requirements:
1. Increase S and I properties for simple or two span continuous to achieve equivalent load capacity. Minimum allowable diaphragm shear furnished, per ICC report, shall be as indicated on Drawings.
2. Sections and properties shall meet AISC Specifications.

1.02 SUBMITTALS

A. Shop Drawings: Submit shop and erection Drawings showing layout, material and fastening methods and each piece to be erected. Note deck welding pattern and physical properties of decking.

B. Report: Submit ICC report showing diaphragm shear test.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Welding: Performed by certified welders in compliance with AWS D.1.3 requirements and procedures for manual shielded metal arc welding.

B. Certifications:
1. Prior to fabrication or shipment of material to the job site, furnish certification of the manufacturer of the steel decking that material furnished meets or exceeds requirements of ASTM standards specified or noted on Drawings, for each type of material.
2. Prior to site welding operation, submit welders' written certifications and qualifications.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle metal decking in manner which will prevent damage or deformation.

B. Stack decking stored at the site before erection on platforms or pallets, and suitably protect from the weather.

C. Exercise special care so as not to damage or overload the decking during the construction period.

D. Do not use metal decking for storage or as a working platform until the sheets have been welded in position.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following Manufacturers, except as approved by Architect and Resident Engineer, subject to conformance with Specification requirements:
1. Consolidated Systems, Inc. www.csisteel.com
2. Metal Deck, Inc.
3. United Steel Deck, Inc. www.njb-united.com/usd.htm
4. Verco Manufacturing, Inc. www.vercodeck.com
5. Vulcraft Division, Nucor Corp. www.vulcraft.com/sc
6. Wheeling Corrugating Division www.wheelingcorrugating.com
7. Or equal.

2.02 MATERIALS - GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

2.03 RIBBED DECK

A. Provide one-hour rated steel deck for concrete system and accessories as shown on detail 4/S1.4 of the Structural Drawings.

2.04 ACCESSORIES

A. Furnish miscellaneous supporting members at openings and edges, as shown on Drawings and as required.

B. Galvanizing Repair Paint: High zinc-dust content paint complying with SSPC Paint 20 (94 percent minimum zinc dust content, dry film, by weight). Comply with Section 01 60 00 requirements for low-emitting materials used within interior of structure.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Erector shall examine subsurfaces to receive Work and report detrimental conditions, in writing, with a copy to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Before proceeding, verify that required inspections of existing conditions have been completed.

3.02 ERECTION - RIBBED DECK

A. Place deck sheets in accordance with approved erection layout Drawings.

B. Deck units shall be fabricated to span three or more support spacings, with end laps of at least two inches which shall occur over supports. Male joint of side laps shall engage female joint by at least 5/8 inch.

C. Openings shown on the erection layout Drawings shall be cut by the deck erector. Openings not shown on the erection diagram, such as those required for stacks, conduits, plumbing vents, etc. shall be cut and reinforced if necessary, by the Trade requiring the openings.

D. Attach deck to supporting members by fusion welding. Care shall be exercised by the welder in the selection of electrodes and amperage to provide positive welds and prevent high amperage blow holes. Welds shall be made from the top side of the deck with the welder following close behind the placement crew.

E. Welding washers are not necessary for ribbed deck of 22 gauge or heavier, or when the bottom rib width equals or exceeds 5/8 inch.

F. Where washers are required, weld deck to steel framing through 16 gauge welding washers with 1 inch x 3/8 inch puddle welds. Maximum weld spacing shall be as follows unless noted otherwise on the Structural Drawings:
1. End and end laps: 6 inches o.c.
2. Intermediate supports: 6 inches o.c.
3. Edges, perimeter beams and angles parallel to deck flutes: 12 inches on center
4. Opening edges: 6 inches on center

G. Weld sheets to each other with side seam welds at 12 inches on center.

3.03 FIELD QUALITY CONTROL

A. Tests: When required by the Architect and Resident Engineer, installation of metal decking and welding shall be subject to inspection by a qualified Testing Agency acceptable to Architect and Resident Engineer, the cost of which will be paid in accordance with requirements of Section 01 45 00.

B. The Testing Agency shall:
1. Test and inspect metal decking and workmanship to verify compliance with Contract Documents.
2. Check material, equipment, procedures, welds, ability of welders.
3. Furnish Architect and Resident Engineer with a verified report that completed Work conforms with Contract Documents.

3.04 CLEANING

A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 05 41 00

LOAD-BEARING METAL STUD SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Load-bearing metal stud system for interior framing and load-bearing and non-load bearing exterior framing as shown on Drawings and as specified.

B. Work performed under this section shall also comply with the requirements of the Structural Notes on the structural drawings.

C. Related Sections:
1. Section 09 22 16 – Metal Support Assemblies: Light gauge metal studs for interior partitions.

1.02 SYSTEM DESCRIPTION

A. Design Requirements: Design structural members in accordance with AISI "Specification for the Design of Cold-formed Structural Steel."
1. Maximum allowable deflection:
   a. Walls receiving gypsum wallboard finishes: L/240.
   b. Walls receiving plaster and brittle finishes, including stucco: L/240.
   c. Walls receiving ceramic tile finishes: L/360.
2. Design system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
3. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
4. Design and construct system as required to meet seismic requirements as noted on Structural Notes.

1.03 SUBMITTALS

A. Product Data: Submit Manufacturer's Specifications, design data and installation instructions.

B. Shop Drawings: Submit Drawings showing layout, dimensions and construction details.

C. Certificates:
1. Submit Mill Certification with shipment to verify chemical composition, yield strength, tensile strength, elongation and coating thickness. Include listing of applicable ASTM standards specified in this section and comparison of ASTM requirements to actual materials provided to jobsite.
2. Submit Manufacturer's certification that products furnished meet or exceed the specified design requirements.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.04 QUALITY ASSURANCE

A. Welding: Performed by certified welders in compliance with AWS D1.3 Structural Welding Code Sheet Steel.

B. Regulatory Requirements: Manufacturers shall have current ICC or CABO evaluation report.

1.05 DELIVERY, STORAGE AND HANDLING

A. Exercise care during unloading, storage and erection to avoid damage. Dumping on the ground is not permitted.

B. Support material stored at the site completely free of the ground, and cover to avoid damage from the elements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products as manufactured by a manufacturing member of the Steel Stud Manufacturers Association (SSMA) www.ssma.com, or equal, subject to compliance with Specification requirements.

2.02 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Studs, Track, Bracing and Bridging: Conform to ASTM C955.
1. ASTM A653, G60 hot-dip galvanized coating.
2. Minimum structural properties: In accordance with Structural Notes.

C. Track: Channel shaped; same width as studs, for tight fit; 16 gage solid web, galvanized or painted to match studs.

D. Bracing, Furring, Bridging: Formed galvanized sheet steel; channel shaped. Provide CRC - 1-1/2 inch x 16 gage bridging.

E. Plates, Gussets, Clips:
1. Galvanized formed steel, thickness determined for conditions encountered, Manufacturer's standard shapes.
2. Connector devices (VertiClip, DriftClip and StiffClip) as manufactured by the STEEL Network, Inc. (TSN), Raleigh, NC (888) 474-4876 www.steelnetwork.com or equal are acceptable.

F. Fasteners and Attachments:
1. Sheet metal: Self-drilling self-tapping screws, type appropriate for attachment detail requirements with penetration through joined materials not less than 3 exposed threads.
2. Anchorage devices to structural components: Power driven or powder actuated, drilled expansion bolts, or screws, with sleeves.

G. Welding Electrodes: Comply with AWS standards and as indicated on General Structural Notes on Drawings.

2.03 FABRICATION

A. Fabricate assemblies of framed sections of sizes and profiles required, with framing members fitted, reinforced and braced to suit design requirements.

B. Fasten metal studs by welding or screw-fastening as indicated. Do not fasten framing members by wire tying.

C. Fit and assemble in largest practical sections for delivery to site, ready for installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 ERECTION

A. Install components in accordance with Manufacturer's instructions.

B. Align floor and ceiling tracks; locate to wall and partition layout. Secure in place with fasteners or welding at maximum 24 inches. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches o.c.; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method unless noted otherwise.

D. Construct corners using minimum three studs. Double stud at wall opening, door and window jambs.

E. Erect load bearing studs one piece full length. Splicing of studs is not permitted.

F. Erect load bearing studs, brace and reinforce to develop full strength to meet design requirements.

G. Extend stud framing to underside of floor or roof structure above.

H. Fasten metal studs by welding or screw-fastening as indicated. Do not fasten framing members by wire tying.

I. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

J. Install intermediate studs above and below openings to match wall stud spacing.

K. Provide deflection allowance in stud track, directly below horizontal building framing for non-load bearing framing.

L. Attach cross studs or furring channels to studs for attachment of fixtures anchored to walls.

M. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

N. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 FIELD QUALITY CONTROL

A. Testing: At Owner's request, Contractor shall provide spot testing of actual properties of steel framing to verify compliance with specifications.

3.04 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Metal fabrications, including items fabricated from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems in other Sections of these Specifications. Types of metal items include, but are not limited to, the following:
1. Carpenter's ironwork.
2. Steel pipe guards
3. Steel pipe bollards.
4. Ladders.
5. Miscellaneous framing and supports.
6. Miscellaneous steel trim.
7. Coiling door jamb channel.
8. Sign bracing.
9 Flagpole bracing.
10. Enclosure gates and hardware.
11. Other items as indicated.

B. Related Sections:
1. Section 32 31 19 - Ornamental Fences and Gates

1.02 SUBMITTALS

A. Shop Drawings: Submit Drawings for the fabrication and erection of assemblies of items which are not completely shown by the Manufacturer's data sheets.
1. Include plans and elevations at not less than 1 inch to 1'-0" scale, and include details of sections and connections at not less than 3 inches to 1'-0" scale.
2. Show anchorage and accessory items.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Standards: Comply with the following, except as otherwise shown and specified:
1. AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings."
2. AISI "Specifications for the Design of Cold-Formed Steel Structural Members."
3. AWS "Structural Welding Code-Steel."
4. ASTM A6 "General Requirements for Rolled Steel Plates Shapes, Sheet Piping and Bars for Structural Use."

B. Qualifications: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

1.04 DELIVERY, STORAGE AND HANDLING

A. Exercise care during unloading, storage and erection to avoid damage. Dumping on the ground is not permitted.

B. Support material stored at the site completely free of the ground, and cover to avoid damage from the elements.

1.05 PROJECT/SITE CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of Shop Drawings and fabrication, where possible, to ensure proper fitting of the Work. Allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the Work.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Wide Flange Steel Sections: ASTM A572 or A992 (Fy = 50 ksi).

C. Steel Shapes, Plates, Rod, Bars and Bar-size Shapes: ASTM A36. Thickness / gauge shall be as indicated on Drawings.

D. Steel Tubing (Cold-formed Welded and Seamless): ASTM A500, Grade b (Fy = 42 ksi).

E. Steel Tubing (Hot Formed Welded and Seamless): ASTM A501, (Fy = 36ksi).

F. Cold-Finished Carbon Steel Bars: ASTM A108, Grade as selected by fabricator.

G. Hot-rolled Carbon Steel Sheets and Strips: ASTM A568 and ASTM A569, pickled and oiled.

H. Cold-rolled Carbon Steel Sheets: ASTM A611.

I. Hot-dip Galvanized Steel Sheets: ASTM A653, with G90 zinc coating.

J. Cold-drawn Steel Tubing: ASTM A512, sunk drawn, butt welded, cold-finished and stress-relieved.

K. Steel Pipe: ASTM A53, type as selected; Grade A. Black finish unless galvanizing is required. Standard weight, Schedule 40, unless otherwise shown or specified.

L. Anchors:
1. Masonry Anchorage Devices: Expansion shield, FS FF-S-325.
2. Toggle bolts: Tumble-wing type, FS FF-B-588; type, class and style as required.
3. Chemical Type Anchors: 2-component chemically curing anchors for concrete or masonry construction, capsule or injection type, designed to accept manufacturer's galvanized anchor rod.

M. Fasteners: Provide zinc-coated fasteners with galvanizing complying with ASTM A153 for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required for the installation of miscellaneous metal items.
1. Bolts and nuts: ASTM A307, Grade A, regular hexagon head.
2. Bolts, hexagon and square: ANSI B-18.2.1.
3. Bolts, round head: ANSI B-18.5.
4. Lag bolts: Square head type.
5. Wood screws: ANSI B-18.6.1, flat head carbon steel.
6. Plain washers: ASTM F844 helical spring type carbon steel.

N. Galvanizing: ASTM A123 for steel plates, bars and strips.

O. Metal Primer: VOC compliant.
1. Interior Steel: Zinc oxide, alkyd primer, high-solids content, conforming to SSPC-Paint 25.1.
2. Exterior Steel (exposed): 2-component, moisture-cured zinc-rich primer conforming to SSPC-PS 12.01.
3. See also Section 09 91 00 for requirements regarding paints for compliance with LEED™ requirements.

2.02 ACCESSORIES

A. Inserts and Anchorages: Furnish inserts and anchoring devices to be set in concrete or built into masonry for installation of Miscellaneous Metal Work. Provide setting Drawings, templates, instructions and directions for installation of anchorage devices.

B. Concrete Fill (for concrete filled pipe bollards): Comply with requirements of Section 03 30 00 for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi.

2.03 FABRICATION

A. General: For fabrication of Miscellaneous Metal Work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding or by welding and grinding, prior to cleaning, treating and application of surface finishes, including zinc coatings.

B. Shop Assembly: Preassemble items in shop, when possible, to minimize field splicing and assembly of units at the site. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Workmanship:
1. Use materials of the size and thickness shown, or if not shown, of the required size and thickness to produce adequate strength and durability of the finished product for the intended use. Work to the dimensions of fabrication and support. Use type of materials shown or specified for various components of Work.
2. Form exposed Work true to line and level with accurate angles, surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise shown. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing the Work.
3. Weld corners and seam continuously and in accordance with the recommendations of AWS. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

4. Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type shown, or if not shown, use Phillips flat-head (countersunk) screws or bolts.
5. Provide for anchorage of type shown, coordinated with supporting structure and the progress schedule. Fabricate as required to provide adequate support for the intended use of the Work.
6. Cut, reinforce, drill and tap Miscellaneous Metal Work as may be required to receive finish hardware and similar items of Work.
7. Use hot-rolled steel bars for Work fabricated from bar stock, unless Work is indicated to be fabricated from cold-rolled, or cold-finished stock.

D. Carpenter's Iron Work:
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 are specified in Division 6 Sections.
2. Manufacture or fabricate items of sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

E. Ladders:
1. Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as required. Comply with requirements of ANSI A14.3, except as otherwise shown.
2. Fit rungs into punched holes in centerline of side rails, plug weld and grind smooth on outer rail faces.
3. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold the ladder 6 inches clear of the wall surface and other obstructing construction. Extend rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided If the adjacent structure does not extend above the top rung, gooseneck the extended rails back to the structure to provide secure ladder access.
4. Provide non-slip surfaces on the top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.
5. Exterior ladders shall have hot-dipped galvanized finish.

F. Coiling Door Jamb Channel: Channel shall be constructed from structural shapes and sizes indicated on drawings. All welds shall be continuous, tack welding shall not be permitted. Grind all welds smooth.

G. Hose Drying Rack: Rack shall be constructed from structural shapes and sizes indicated on drawings. All welds shall be continuous, tack welding shall not be permitted. Grind all welds smooth.

H. Hose Storage Rack: Rack shall be constructed from structural shapes and sizes indicated on drawings. All welds shall be continuous, tack welding shall not be permitted. Grind all welds smooth.

I. Miscellaneous Framing and Supports:
1. Provide miscellaneous steel framing and supports which are not a part of the structural steel framework, as required to complete Work.

2. Fabricate miscellaneous units to sizes, shapes and profiles shown, or if not shown, of the dimensions required to receive adjacent grating, plates, doors or other Work to be retained by the framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars of all welded construction using mitered corners, welded brackets and splice plates, and a minimum number of joints for field connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the Work.
3. Equip units with integrally welded anchor straps for casting into concrete or building into masonry wherever possible. Furnish inserts if units must be installed after concrete is poured. Except as otherwise shown, space anchors 24 inches o.c., and provide minimum anchor units of 1-1/4 inch x 1/3 inch x 8 inch steel straps.

J. Enclosures and Enclosure Gates: Fabricate to sizes and shapes indicated using galvanized steel tubing and shapes with skin as indicated on drawings and as detailed. Fabricate with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.
1. Hinges: Provide heavy duty galvanized steel or aluminum butt hinges sized as required for weight of gate. Weld hinges to frame.
2. Provide motor an all accessories required to power gates as called for on Drawings.

K. Fabricate pipe bollards from steel pipe of diameter indicated on Drawings.

L. Miscellaneous Steel Trim: Provide shapes and sizes as required for the profiles shown. Except as otherwise noted, fabricate units from structural steel shapes and 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.

2.04 FINISHING

A. Galvanizing: Comply with ASTM A123 and A153 for the hot-dip process after fabrication.

B. Shop Painting:
1. Shop paint Miscellaneous Metal Work, except those members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.
2. Remove scale, rust and other deleterious materials before shop coat of paint is applied. Clean in accordance with SSPC SP-2, SP-3, or SP-7, as required. Remove oil, grease and similar contaminants in accordance with SSPC SP-1.
3. Apply one shop coat of metal primer paint to fabricated metal items, except apply 2 coats of paint to surfaces which are inaccessible after assembly or erection.
4. Immediately after surface preparation, brush or spray on metal primer paint in accordance with Manufacturer's instructions, and to provide a uniform dry film thickness of 2 mils for each coat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates to appropriate Trades.

C. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on Shop Drawings.

D. Perform field welding in accordance with AWS D1.1.

E. Install pipe bollards in concrete footings plumb and level, accurately fitted, free from distortion or defects. Provide adequate bracing as required to hold bollard in position until concrete has been placed and cured.
1. Fill bollards solidly with concrete and mound top surface to shed water.

F. Obtain Architect and Resident Engineer approval prior to site cutting or making adjustments not scheduled.

G. Touch-up Painting: Touch-up welds, abrasions, and other areas where shop prime paint has been removed or is damaged with specified prime paint or galvanizing repair paint.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset from True Alignment: 1/4 inch

3.05 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 05 51 00

STEEL STAIRS

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Design Requirements: Steel stairs including stringers, treads (with concrete fill), risers and landings (with concrete fill), shall be designed and fabricated to support dead load plus live load of 100 psf or a concentrated load of 300 pounds, whichever governs. Limit maximum live load deflection to 1/360 span.

B. Work performed under this section shall be a deferred submittal in accordance with Structural Notes on the structural drawings.

1.02 SUBMITTALS

A. Shop Drawings: Submit Drawings showing dimensions, details and erection diagrams. Shop drawings shall be sealed by a Structural Engineer registered in the State of California.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with local code and regulatory agency requirements for stair design and the following:
1. ANSI A117.1, 2003 "Accessible and Usable Buildings and Facilities."
2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
3. ADA Accessibility Guidelines (ADAAG).

B. Welding: Conforming to AWS D1.1 and performed by certified welders.

1.04 DELIVERY, STORAGE AND HANDLING

A. Exercise care during unloading, storage and erection to avoid damage. Dumping on the ground is not permitted.

B. Support material stored at the site completely free of the ground, and cover to avoid damage from the elements.

1.05 PROJECT/SITE CONDITIONS

A. Field Measurements: Verify existing conditions by taking field measurements.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Structural Steel Shapes, Plates, Bars and Bar-Size Shapes: ASTM A36.

C. Steel Tubing: ASTM A500, Grade B (Fy = 46 ksi).

D. Steel Pipe: ASTM A53.

E. Structural Steel Sheet: ASTM A569 or ASTM A570, Grade 30

F. Concrete Fill for Metal Pan Treads: 3,000 psi 28 day compressive strength regular weight concrete complying with Section 03 30 00.

G. Metal Primer: VOC compliant.
1. Interior Steel: Tnemec FD88-559 Gray www.tnemec.com.
2. Exterior Steel: Tnemec Tneme-Zinc 90-97 (organic).
3. See also Section 09 91 00 for requirements regarding paints for compliance with LEED™ requirements.

2.02 FABRICATION

A. Fabrication, General:
1. Conform to Standard Specifications, Rules and Practice of the AISC as described in the "Steel Construction Manual"
2. Form and fabricate the Work to meet installation requirements.
3. Include accessories to adequately secure the Work in place.

B. Shop fabricate metal stairs to designs and configurations indicated on Drawings and to comply with the “Recommended Voluntary Standards for Fixed Metal Stairs” of NAAMM (National Association of Architectural Metal Manufacturers) Standard AMP 510 “Metal Stairs Manual” for Commercial Classification of stairs, except where more stringent requirements are specified:

C. Metal Pan Units:
1. Form metal pans of 12 gage thick structural steel sheet.
2. Shape pans to conform to configurations shown.
3. Construct riser and subtread metal pans with steel angle or bar supporting brackets, of size shown, welded to stringers.
4. Secure metal pans to brackets with welds, as shown.
5. Secure subplatform metal pans to platform frames with welds.

D. Fabricate stringers of structural steel shapes as shown. Provide closures for exposed ends of stringers and interior pans.

E. Provide metal framing, hangers, columns, struts, clips, brackets, bearing plates and other components as required for support of stairs and platforms.

G. Shop/Factory/Finishing: Clean metal work of grease, rust, mill scale and other foreign matter, and give a coat of primer.

H. Galvanizing: ASTM A653, Class G-60. Prepare galvanized surfaces as required to receive paint finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

A. Where masonry walls support the Steel Stair Work, provide temporary supporting struts, designed for the erection of steel stair components before installation of masonry.

3.03 ERECTION

A. Make connections between members, unless otherwise indicated, by the use of welds or bolts.

B. Conceal connections in finished Work where possible.

C. Accurately align members for miter exposed joints with hairline joints.

D. Perform welding by the shielded arc method.

E. Grind welds in finished surfaces smooth with no identifying marks remaining exposed.

F. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and tight.

G. Touch-Up Painting:
1. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
2. Remove temporary guys, bracing and bracing clips. Grind flush remaining burrs before painting. Remove welding slag, splatter, rust and burnt paint and clean welds by wire brushing before touch-up.

3.04 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 05 52 00

HANDRAILS AND RAILINGS

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Structural performance of handrails and railing systems: Comply with ASTM E985 based on testing in accordance with ASTM E894, ASTM E935 and IBC Section 1607.7.
   1. Guardrails and handrails shall meet or exceed all applicable building codes.
   2. Railings shall have high strength steel to comply with structural requirements with an appropriate safety margin.
   3. Internal members shall be stainless steel or aluminum to eliminate the possibility of rust.
   4. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

B. Design Requirements: Comply with ASTM E985 and IBC Section 1006 and Section 16.

C. Thermal Movements: Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, over stressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.02 SUBMITTALS

A. Shop Drawings: Submit Drawings showing dimensions, details and erection diagrams, connections with other work, and calculations sealed by a qualified Structural Engineer registered in the State where the Project is located, certifying conformance with Code and Performance Requirements.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with local code and regulatory agency requirements for handrail and railing design and the following:
   1. ANSI A117.1, 1998 "Accessible and Usable Buildings and Facilities."
   2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
   3. ADA Accessibility Guidelines (ADAAG).

B. Welding: Conforming to AWS D1.1 and performed by certified welders.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with manufacturer's instructions.

1.05 PROJECT/SITE CONDITIONS

A. Field Measurements: Verify existing conditions by taking field measurements.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Structural Steel Shapes, Plates, Bars and Bar-size Shapes: ASTM A36.

C. Steel Tubing: ASTM A500, Grade B (Fy = 46 ksi).

D. Gray Iron Castings: ASTM A48, Class 30.

E. Malleable Iron Castings: ASTM A47, Grade as selected.

F. Steel Pipe: ASTM A53, type as selected, Grade A standard weight (Schedule 40).

G. Wire Rope (Cable Railing):
1. Cable: ASTM A475 or ASTM A363, extra-high strength grade, zinc coated steel, prestretched, 1 x 19 structural multiple wire rope..
3. Nominal Diameter: 3/8-inch, unless otherwise indicated.
4. Termination Studs, Turnbuckles and Fittings: Provide Type 316 stainless steel turnbuckles and fittings of the style selected by Architect and Resident Engineer. Provide turnbuckles and fittings capable of sustaining loads equal to or greater than wire rope being connected, without failure.
   a. Acceptable Manufacturers:
      1) Feeney Wire Rope and Rigging, Oakland, CA www.feeneywire.com
      2) Hayn Enterprises, LL, Rocky Hills, CT www.hayne.com
      3) C. Sherman Johnson Co., Inc., East Haddam, CT www.csjohnson.com
      4) Or equal
   b. Products:
      1) CableRail Quick-Connect Jaw Turnbuckle as manufactured by Feeney, or equal.
      2) CableRail Quick-Connect Fixed Jaw End as manufactured by Feeney, or equal.

H. Metal Primer: VOC compliant.
1. Interior Steel: Tnemec FD88-559 Gray www.tnemec.com or equal.
2. Exterior Steel: Tnemec Tneme-Zinc 90-97 (organic) or equal.
3. See also Section 09 91 00 for requirements regarding paints for compliance with LEED™ requirements.

I. Anchoring Cement: Prepackaged, erosion-resistant, non-shrink hydraulic controlled anchoring cement recommended for exterior use.

J. Nonshrink, Nonmetallic Grout: Prepackaged, non-shrink, nonstaining grout complying with ASTM C 1107 and recommended for interior and exterior use as applicable.

2.02 FABRICATION

A. Shop Assembly:
1. Conform with AISC Standard Specifications, Rules and Practice in the "Steel Construction Manual."
2. Preassemble items in shop to the greatest extent possible to largest practicable sizes to minimize field splicing/welding and assembly of units at the site.
3. Limit size of shop assembled units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
4. Form and fabricate the Work to meet installation conditions.
5. Include accessories to adequately secure the Work in place.
6. Make provisions to connect with or to receive abutting construction.

B. Shop/Factory/Finishing: Clean surfaces of grease, rust, mill scale, and other foreign matter, and apply coat of primer.

C. Make connections between members, unless otherwise indicated by welding.
1. Cope and cut components for hairline fit prior to welding.
2. Accurately align members.
3. Fabricate joints watertight for exterior applications.
4. Welds shall be flush type, with fillets dressed to uniform radius, using the shielded arc method.
5. Make provisions to allow for thermal expansion of handrails and railings.

D. Where bolted or screw connections are indicated or necessary, use round or oval head bolts and tamper-resistant screws and conceal in the finished work to the greatest extent possible.

E. Provide metal end caps at exposed or open end conditions.

F. Grind welds, projections and corners in finished surfaces smooth. No identifying marks shall remain exposed.

G. Wire Rope and Fittings: Fabricate wire rope intermediate rails from galvanized wire rope, termination studs, turnbuckles and fittings as detailed on drawings.
1. Provide wire rope in continuous lengths for each railing section.
2. Cut wire rope to necessary lengths to allow proper tensioning of installed rope section between supporting end terminations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Install steel railings and handrails at locations indicated.

B. Install items anchored in concrete in the formwork, where practicable.

C. Install items to be built into masonry so masonry can be built up to them.

D. Where indicated, anchor posts in concrete with core drilled holes or pre-set sleeves of diameter at least 3/4" more than diameter of post being anchored and not less than 5" deep. Fill space with non-shrink, non-metallic grout or anchoring cement.

E. Install posts and vertical members plumb within 1/8 inch of vertical. Install longitudinal members parallel with each other and to floor surfaces or slope of stairs to within 1/8 inch per 10 running feet.

F. Securely anchor wall brackets.

G. Cables: Install parallel and taut, anchored to supporting posts and end termination as detailed on Drawings and approved Shot Drawings.
1. Install wire rope in continuous lengths for each railing section.
2. Tension each section between supporting end terminations, without sag.
3. Re-tension installed wire rope sections as necessary after initial relaxation of rope and just before final occupancy of Project.

3.03 CLEANING

A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 05 59 23

FIREPOLES

PART 1 GENERAL

1.01 SUBMITTALS

A Shop Drawings:
1. Submit Shop Drawings of proposed work of this Section.
2. Include plans, sections and elevations at not less than 1 inch to 1'-0" scale, and include details of connections at full size.

B. Product Data: Submit product data for proprietary items used.

1.02 QUALITY ASSURANCE

A. Pre-Installation / Pre-construction Conference: Contractor shall schedule a meeting with the Architect and Resident Engineer at the jobsite prior to construction of firepoles to review the work to be provided. The purpose of the meeting will be to review the level of quality of work to be provided and to determine a schedule of inspections for attachments, installation and other critical stages of the construction.

1.03 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.

B. Storage: Store off ground and under cover, protected from damage.

C. Handling:
1. Handle materials so that surfaces are protected.
2. Prevent distortion or damage to fabricated pieces.
3. Handle metal which will be exposed in the completed work with gloved hands to prevent skin oils from staining surface. Metal finishes are to be unstained in the final work.

1.04 PROJECT CONDITIONS

A. Measurements: Verify dimensions by taking field measurements; proper fit and attachment of items is required.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. McIntire Brass Works, Inc., Somerville, MA, (617) 547-1819 https://slidepole.com or equal.

2.02 MATERIALS

A. Stationary Pole:
1. Constructed of 3-1/4" diameter 5/32" wall cold drawn brass tubing.
2. Length: 28'-3-1/4" (verify in field). Pole shall pan from first floor to bottom of 3rd level.
3. Include the following:
a. Floor flange
b. Ceiling flange
c. Landing mat.
1) Diameter: 32inches
2) Thickness: 2 inches
3) Material specifications: ASTM-D-1056-85, Grade 2C2-E1 closed cell black neoprene mat.
4. Provide framing/blocking and fasteners as required to rigidly attach pole to structure at 3rd floor construction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
1. Examine the areas and conditions under which the work of this Section will be performed and report detrimental conditions in writing to Architect and Resident Engineer.
2. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
3. Commencement of Work will be construed as acceptance of subsurfaces.
4. Examine alignment of support members before installing firepoles. Do not proceed with such installation if the members are not aligned to the tolerances required by firepole Manufacturer.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

A. Field measurements: Verify dimensions before proceeding with the Work. Obtain field measurements for work required to be accurately fitted to other construction. Be responsible for the accuracy of such measurements and precise fitting and assembly of finished work.

3.03 INSTALLATION

A. Coordination: Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section. Coordinate schedules for installation of the work of this Section with schedules for other installations to assure orderly progress of the total construction sequence.

B. Install firepoles accurately placed in location, plumb, level and in alignment and elevation with adjoining work. Fit field connections accurately together to form hairline joints.

3.04 CLEANING

A. Upon completion of this portion of the Work, promptly clean exposed portions and remove traces of dirt, grease and foreign materials.

B. Construction Waste: In accordance with Section 01 74 19.

3.05 DAMAGE AND REPAIR

A. Upon completion of the installation, visually check exposed surfaces of the work of this Section, and touch up scratches and abrasives to be completely invisible to the unaided eye from a distance of five feet.

B. Stained metal surfaces which are visible in the final work shall be removed and replaced with new, unstained materials.

END OF SECTION

SECTION 05 70 00

ORNAMENTAL METALWORK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Stainless steel kitchen countertops
2. Stainless steel wall surface adjacent to the range cooking surfaces, including sides of cabinets.
3. Miscellaneous interior ornamental metalwork.

1.02 QUALITY ASSURANCE

A. Subcontractor qualifications: Fabricate and install the work of this Section using a subcontractor having a minimum of 2 years experience in this type of work. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance and desired aesthetic affect of the work of this Section.

B. Reference standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following.
1. NAAMM Metal Finishes Manual
2. AWS Structural Welding Code

C. Exposed ornamental and sheet metal and mockups of typical conditions, colors of sealants, coordination with adjacent/adjoining materials to be site approved by Architect and Resident Engineer.
1. Where appropriate, Architect and Resident Engineer will provide reviews at factory/fabrication site and final approval at Building Site.
2. Metals shall be installed to ensure minimal surface deformation/deflection and shall be free of staining.

D. Pre-Installation / Pre-construction Conference: Contractor shall schedule a meeting with the Architect and Resident Engineer at the jobsite prior to construction of ornamental metal items to review the work to be provided. The purpose of the meeting will be to review the level of quality of work to be provided and to determine a schedule of inspections for attachments, installation and other critical stages of the construction.

1.03 SUBMITTALS

A Shop Drawings:
1. Submit Shop Drawings of proposed work of this Section.
2. Include plans, sections and elevations at not less than 1 inch to 1'-0" scale, and include details of connections at full size.
3. Exterior cladding: Submit drawings showing layouts, sizes, gauges, methods of construction and installation, including sizes and types of fastening devices, and other details as necessary to erect a weathertight assembly.

B. Product Data: Submit product data for proprietary items used.

C. Samples: Sample panels or representative shapes of ornamental items, showing proposed metal finishes to be used in this Section, for approval of finishes. For stainless steel channel construction, provide samples of finish and attachment details.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.

B. Storage: Store off ground and under cover, protected from damage.

C. Handling:
1. Handle materials so that surfaces are protected.
2. Prevent distortion or damage to fabricated pieces.
3. Handle stainless steel and galvanized metal which will be exposed in the completed work with gloved hands to prevent skin oils from staining surface. Protect galvanized finish from machine and other oils which will discolor surface. Stainless steel and galvanized finishes are to be unstained in the final work.

1.05 PROJECT CONDITIONS

A. Measurements: Verify dimensions by taking field measurements; proper fit and attachment of items is required.

PART 2 PRODUCTS

2.01 MATERIALS

A. Stainless steel:
1. Tubing and pipe: ASTM A269 and ASTM A312, seamless, and unless indicated otherwise on Drawings, required by design, or directed by Owner, provide Type 304 with minimum wall thickness equivalent to Schedule 40.
2. Plate, sheet, and strip:
a. ASTM A167 and unless indicated otherwise on Drawings, required by design, or directed by Owner, provide Type 304.
b. Stainless steel wall surface adjacent to range cooking surface: 22 gauge.
3. Castings: ASTM A743 and unless indicated otherwise on Drawings, required by design, or directed by Owner, provide Grade CF-8.
4. Finish: No. 4 unless noted otherwise indicated on Drawings.

B. Fasteners: Unless otherwise noted on drawings and details, provide the following.
1. Stainless steel Type 300 series, selected to prevent galvanic action with the components fastened.
2. Where exposed in finished surfaces, use oval-head countersunk cross-headed screws with head diameter one (1) screw size smaller than the shank diameter, finished to match adjacent surfaces.

2.02 ACCESSORY MATERIALS

A. Supporting framework: In accordance with Section 05 41 00 – Structural Metal Stud Framing or Section 09 22 16 – Metal Support Assemblies as applicable. Provide 2 inch deep channels unless otherwise noted on Drawings.

2.03 FABRICATION

A. General: Fit and assemble work in the shop as far as practicable.

B. Design and fabricate ornamental and artistic metalwork to conform to approved Shop Drawings and Artists Renderings to designs, sizes, shapes, patterns and configurations shown with type of metals indicated. Hand-forge and/or provide whatever other special techniques and methods required to achieve the artistic intent and type finish desired for the work.

C. Fabricate items with concealed attachments for connecting to other work, unless otherwise indicated.

D. Shop weld or braze all joints in the shop to the greatest extent possible to comply with AWS recommended practices.

E. Joints: Carefully fit and match work with continuity of line and design, using rigidly secured joints with hairline contact, unless otherwise indicated. Reinforce members and joints with plates, bar, rods or angles for rigidity and strength as needed to fulfill performance requirements. Use concealed non-ferrous metal fasteners for jointing which cannot be welded. Where exposed fasteners are unavoidable in the finished work provide Phillips flat-head machine screws countersunk flush with the adjoining surface, unless other fasteners indicated or detailed.

F. Finishes: Provide with finish in accord with NAAMM AMP501 to match approved samples

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
1. Examine the areas and conditions under which the work of this Section will be performed and report detrimental conditions in writing to Architect and Resident Engineer.
2. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
3. Commencement of Work will be construed as acceptance of subsurfaces.
4. Examine alignment of support members before installing ornamental metalwork. Do not proceed with such installation if the members are not aligned to the tolerances required by ornamental metalwork Manufacturer.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

A. Field measurements: Verify dimensions before proceeding with the Work. Obtain field measurements for work required to be accurately fitted to other construction. Be responsible for the accuracy of such measurements and precise fitting and assembly of finished work.

3.03 INSTALLATION

A. Coordination: Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section. Coordinate schedules for installation of the work of this Section with schedules for other installations to assure orderly progress of the total construction sequence.

B. Cut, drill, and fit ornamental metal work and trim as required for installation. Do not cut or abrade finishes that cannot be restored in the field. Stainless Steel shall be passivated after all cutting and forming to assure against rust spotting.

C. Install items accurately placed in location, plumb, level and in alignment and elevation with adjoining work. Fit field connections accurately together to form hairline joints.

D. Install countertops, cladding, panels, fasteners, trim, and accessories in accordance with manufacturer's instructions and as indicated on Drawings.
1. Make cuts, bends, punching and drilling accurate, neat and properly located.
2. Use concealed fasteners.
3. Grind and file smooth parts exposed to view; leave exposed surfaces free of fabrication marks. Make members true to length to allow assembly without fillers.
4. Provide holes and connections as required for other trades.
5. Install cladding plumb and true and in proper alignment and relation to wall framing.
6. Repair or replace, as directed, panels and trim which have been damaged.

E. Brazed Connections: Connect joints by brazing to comply with applicable AWS specifications.

F. Attachment: Fasten metal work to solid masonry with expansion bolts or with fiber plugs and to hollow block with toggle bolts. Provide screws threaded full length to the head of the screw.

G. Install vertical members plumb within 1/8 inch of vertical. Install longitudinal members parallel with each other and to floor surfaces to within 1/8 inch per 10 running feet.

3.04 CLEANING

A. Upon completion of this portion of the Work, promptly clean exposed portions and remove traces of dirt, grease and foreign materials.

B. Construction Waste: In accordance with Section 01 74 19.

3.05 DAMAGE AND REPAIR

A. Upon completion of the installation, visually check exposed surfaces of the work of this Section, and touch up scratches and abrasives to be completely invisible to the unaided eye from a distance of five feet.

B. Stained metal surfaces which are visible in the final work shall be removed and replaced with new, unstained materials.

END OF SECTION

SECTION 06 10 53

MISCELLANEOUS CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Rough carpentry including, but not limited to:
1. Plywood telephone and electrical backer boards
2. Miscellaneous backing, blocking, nailers and curbs.
3. Treated exterior grade plywood to be buried for blindside waterproofing as specified in Section 07 17 16 - Bentonite/HDPE Sheet Waterproofing.

1.02 SUBMITTALS

A. Product Data: Submit technical data for wood preservative and fire retardant products.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Identify each piece of lumber or plywood used for structural framing with grade and trade mark of a lumber grading organization. Trade mark of manufacturer shall also appear on each piece.

B. Grading Rules: Conform with applicable requirements of American Lumber Standards "Simplified Practice Recommendation R-16" and to grading rules of manufacturer's association under whose rules the lumber is produced.

C. Standards: Conform with requirements of American Plywood Association, U. S. Dept. of Commerce Commercial Standards and American Wood Preservers Association Standards, as they apply.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.

B. Storage: Store off ground to assure adequate ventilation, and protect against damage while stored at the site.

C. Handling: Comply with manufacturer's instructions.

1.05 PROJECT CONDITIONS

A. Physical Requirements for Proper Installation or Application: Store materials for which a maximum moisture is specified in areas where humidity can be controlled.

PART 2 PRODUCTS

2.01 MATERIALS AND ACCESSORIES - GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

C. See requirements for wood and agrifiber products specified in Section 01 60 00 to comply with LEED EQ Credit 4.4

2.02 LUMBER MATERIALS

A. Species: Douglas Fir – Larch, Hem Fir graded in accordance with Standard Grading and Dressing Rules of WCLIB. Framing lumber shall be stress grade. All sides shall be surfaced.

B. Lumber Grades: As follows unless noted differently on the Drawings:
1. Misc. blocking, bridging, etc: Utility.
2. Grounds and furring: Construction Grade Douglas Fire or No. 2 White Pine.

C. Moisture Content:
1. Lumber shall be air-dried or kiln-dried.
2. At time of installation, moisture content, expressed as a percentage of the weight of the oven-dry wood, shall not exceed 19 percent for lumber of up to two inches nominal thickness and 15 percent for exterior trim and siding.
3. Moisture content of lumber over two inches nominal thickness shall conform to the rules of the association under which it is graded.

2.03 SHEATHING MATERIALS

A. Plywood Backing Panels: Grade C-D Exposure 1 plywood panels unless otherwise indicated.
1. For mounting of telephone and electrical equipment: 15/16 inch thick plywood, unless otherwise indicated.
2. Exercise Room / Physical Conditioning:
   a. Walls shall be backed with minimum 1/2 inch thick plywood, unless otherwise indicated.
   b. Provide backing for mount weight equipment. If plywood backing is insufficient to support the equipment (and user), provide lumber as specified herein or miscellaneous metal as specified in Section 05 50 00.
3. Communications Equipment Room: 3/4 inch plywood.

2.04 FACTORY WOOD TREATMENT

A. Preservative Treatment:
1. Materials:
   a. Chromated copper arsenate (CCA) shall not be allowed.
   b. Provide ammoniacal copper quaternary (ACQ) or copper boron azole (CBA) as produced by the following manufacturers:
      1) Arch Wood Protection, Inc., Smyrna, GA (866) 789-4567, www.wolmanizedwood.com or www.naturalselect.com.

2) Chemical Specialties, Inc., Charlotte, NC (800) 421-8661, www.treatedwood.com
3) Osmose, Inc., Wood Preserv.ing Division, Griffin, GA (800) 241-0240, www.osmose.com.
4) Or equal.

2. Locations Required:
a. Wood sillplates and ledgers bolted in direct contact with concrete or masonry, located at or below grade only shall be pressure treated lumber.
b. Blocking occurring on top of or above the roof deck, including the nailer beneath the flashing at parapet caps, shall be treated lumber.
c. Buried for blindside waterproofing as specified in Section 07 17 16 - Bentonite/HDPE Sheet Waterproofing as detailed at elevator pit.
D. Other locations as required by Code.

B. Fire-Retardant Treatment: Hickson Corp. Dricon FRTW or equal in accordance with UL label.
1. Where required by code, wood studs, plates, sheathing, blocking, etc. shall be pressure treated.
2. Dimensioned lumber shall be kiln dried to a maximum moisture content of 18 percent before and after milling and fire protective treatment..

2.05 ACCESSORIES

A. Nails: Common wire, galvanized for exterior Work, meeting ASTM F1667 of the sizes indicated on the Drawings.

B. Screws: Standard domestic manufacture, bright steel, except galvanized for exterior use and of brass, bronze, aluminum or stainless steel when used to attach items made of those materials. Screws used for attaching interior trim and finish to drywall partitions shall be Type S self-drilling, self-tapping corrosion resistant coated steel drywall screws of required lengths as specified in Section 09 29 00.
1. Screws used for attaching preservative treated wood shall be Type S self-drilling, self-tapping corrosion resistant coated steel screws. Acceptable products include the following:
a. DEC-KING Exterior Wood Screw with Climacoat.
b. Tapcon Concrete Anchor with Blue Climaseal or White UltraShield.
c. Wood-To-Metal TEKS with Grey Spex.
d. Roofgrip with Spex or Blue Climaseal.
e. GY-FAST Nail with Climacoat.
f. Maxi-Set Tapcon White UltraShield.
g. Or equal.

C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers as indicated. Bolts, nuts and washers, wholly or partially exposed on exterior shall be galvanized.

D. Lag screws, shear plates and split ring connectors: Conform to requirements of the "National Design Specifications for Stress Grade Lumber and its Fastenings" of National Forest Products Association.

E. Power driven inserts: Ramset, or equal, as approved by Structural Engineer through Architect and Resident Engineer meeting FS GGG-D-777a. Install as per manufacturer's printed directions. Charge shall be powerful enough to prevent spalling of concrete.

F. Galvanizing: ASTM A653.

G. Toggle Bolts: FS FF-B-588.

H. Field Applied Adhesives: In accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Wood Backing:
1. Provide wood backing, furring, stripping or blocking indicated or required for installation and attachment of work of other trades.
2. Provide fire-proofed wood backing approved by Building Official where required by Code in noncombustible or fire-rated construction.
3. Communications Equipment Room: One 10'-0" wall and one 4'-6" wall shall be covered with plywood, beginning 3'-0" off the floor and extending to 7'-0".

B. Exterior base plates or sills resting on concrete: Bed in cement mortar to obtain a continuous bearing. Mortar shall consist of one part cement to three parts sand. Mix mortar in small quantities so that it can be used promptly. Size plates or sills and set level and true to line. Bolt down with bolts of size, length and spacing indicated with a bolt not more than 9 inches from the end of any piece.

C. At roofs: Provide crickets, cants, equipment curbs, wood saddles, cant strips, curbs for plywood at parapet walls; other miscellaneous backing, blocking, curbing, and wood nailers bolted to tops of concrete, as specified or required.

D. Plywood Backing Panels: Install with the "C" or best face on exposed side.

E. Connections: Subdrill where necessary to avoid splitting.

F. Bolts: Drill bolt holes 1/32 inch larger than bolt diameter. Use square plate or malleable iron washers under heads and nut where they bear against wood. Re-tighten bolts immediately prior to concealing with finish materials. Re-tighten exposed bolts immediately prior to final inspection by Building Official.

E. Lag Screws and Screws: Subdrill, use square plate or malleable iron washer under lag screw heads when they bear on wood.

3.02 CLEANING

A. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of away from premises.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Finish carpentry as noted on Drawings.

1.02 SUBMITTALS

A. Samples: When requested by Architect and Resident Engineer, submit two samples of each species of exposed wood to receive transparent finish at the site. Samples shall be 12 inches by 12 inches in size.

B. Shop Drawings: Indicate materials, components profiles, fastening methods, jointing details and accessories to a minimum scale of 1-1/2 inch to 1'-0".

C. Product Data: Provide data on fire retardant treatment materials and application instructions

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 REFERENCES

A. Reference Standards: Following standards apply to Work of this Section except where more stringent requirements are specified:
1. Architectural Woodwork Standards (AWS), Edition 1.
2. American Wood Preservers Association (AWPA).
3. Hardwood Plywood & Veneer Association (HPVA)
4. National Hardwood Lumber Association (NHLA)

1.04 QUALITY ASSURANCE

A. Applicable Standard: Perform work in accordance with AWI Architectural Woodwork Standards (AWS), Edition 1.
1. Provide Custom when not otherwise indicated.
2. Affix Quality Grade Stamp to each unit of product (e.g. each case; each panel; each bundle of trim, etc.).

B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum of 2 year documented experience.

C. Regulatory Requirements:
1. Flame Spread Index: Where fire-retardant treated wood is specified or required by Code requirements, provide materials that have been tested in accordance with ASTM E84 by a testing and inspecting agency acceptable to authorities having jurisdiction.
2. Fire-retardant treated materials shall be identified with appropriate classification markings indicating rating on surfaces that will be concealed from view in the finished work or by separate removable label applied by the treated wood manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.

B. Storage: Adequately protect against damage while stored at the site.

1.06 PROJECT CONDITIONS

A. Physical Requirements for Proper Installation or Application: Provide humidity conditions which will not damage woodwork.

B. Measurements: Verify dimensions shown on Drawings by taking field measurement; proper fit and attachment of parts is required.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Recycled Content:
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Architectural Woodwork: Minimum 50% pre-consumer recycled content.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.
3. Wood and agrifiber products must contain no added urea-formaldehyde resins in accordance with the requirements of "Low Emitting Materials" as specified in Section 01 60 00.

B. Softwood Lumber: Graded in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified, Douglas Fir species, plain sawn, moisture content of 6-8 percent, with flat grain, of quality suitable for transparent finish. Thicknesses as indicated on Drawings.

C. Softwood Plywood: Graded in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified, Baltic or marine ply face species, rotary cut, APA Marine Grade glue, sanded finish. Thicknesses as indicated on Drawings. Wood and agrifiber products must contain no added urea-formaldehyde resins in accordance with the requirements of "Low Emitting Materials" as specified in Section 01 60 00 - Materials and Equipment.

D. Hardwood Plywood: HPVA HP Graded in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified, veneer core, APA Marine Grade glue, face species and cut as indicated on Drawings. Thicknesses as indicated on Drawings. Wood and agrifiber products must contain no added urea-formaldehyde resins in accordance with the requirements of "Low Emitting Materials" as specified in Section 01 60 00 - Materials and Equipment.

E. Wood Particleboard: Not used.

F. Hardboard: Not used.

G. Base, Moldings, Door Jambs, Door Casing, Window Sills, Case Openings, Chair Rail:
1. Wet conditions including toilet rooms unless noted otherwise: Paint Finish, AWI Grade III and Better Select Fir, Maple, Poplar or Pine.
2. Chair rail at interior corridor at Wainscot: Paint Finish, AWI Grade III and Better Select Fir, Maple, Poplar or Pine.

H. Grounds, Blocking and Furring Strips: #2 White Pine, construction grade Douglas Fir or other sound softwood. Fire treated lumber as required by codes or construction type.

I. Shelving: Douglas Fir, surfaced (S4S).

J. Plastic Laminate: As specified in Section 06 40 00 .

K. Fasteners:
1. Size and type: To suit application, galvanized finish in concealed locations and stainless steel finish in exposed locations.
2. Concealed joint fasteners: Threaded steel.

L. Shelf and Rod Supports: Knape and Vogt Mfg. Co. No. 1195. www.knapeandvogt.com or approved equal.

M. Shelf Standards and Supports: Knape and Vogt #255 and #256, or #87 and #187 or approved equal. Finish to be selected by Architect and Resident Engineer.

N. Wood Treatment Processes - Fire Retardant: Chemically treated and pressure impregnated; capable of providing flame spread/smoke developed ratings required by Building Code in accordance with ASTM E84.

O. Adhesives: Solvent free, zero VOC, nonflammable, nontoxic and acceptable to Architect and Resident Engineer for application as required by Section 01 60 00. Titebond Solvent-Free Construction Adhesive as manufactured by Franklin International, Columbus, OH (800) 877-4583 www.titebond.com or equal is an acceptable product.

2.02 FABRICATION

A. Fabrication shall be in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified.

B. Shop assemble finish carpentry, when possible, for delivery to site in units easily handled and to permit passage through building openings.

C. Shop prepare and identify components for matching during site erection.

D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

E. Plastic Laminate:
1. Apply plastic laminate finish in full, uninterrupted sheets consistent with manufactured sizes.
2. Fabricate components so that corners and joints hairline will have hairline fit; for attachment with concealed fasteners.
3. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

2.03 SHOP FINISHING:

A. Sand work smooth and set exposed nails and other fasteners.

B. Apply wood filler in exposed nail and fastener indentations. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and types recommended for applied finishes.

C. Finish work in the factory in accordance with finish system #2 in accordance with AWI Architectural Woodwork Standards, Section 5 - " Finishing."

D. Seal surfaces in contact with cementitious materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 PREPARATION

A. Priming: Back-prime wood surfaces inaccessible and unexposed after installation before delivery with an approved linseed oil and aluminum primer. Prime coat unfinished metal parts prior to installation.

3.03 INSTALLATION

A. Installation shall be in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Use only hot-dip galvanized or aluminum finish or casing nails. Set nails for putty stopping in surfaced members. Hammer marks not acceptable on exposed finished surface and are subject to rejection of member by Architect and Resident Engineer.

E. Make end splices exposed in finished members bevel splices and not square butted. Install members in as long lengths as possible.

F. Provide and install other miscellaneous millwork items and related items required to complete the Work.

G. Prepare woodwork installed by cleaning and sanding as required to receive finishes specified in Section 09 91 00.

3.04 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 06 40 00

ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings: Submit Drawings showing layout, elevations, dimensions, hardware, construction details, and schedule of finishes.

B. Samples:
1. Submit two 12 inch x 12 inch samples of each wood species to receive transparent finish at job site and at mill.
2. Submit two 6 inch x 6 inch samples of type or color of plastic laminate.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 REFERENCES

A. Reference Standards: Following standards apply to Work of this Section except where more stringent requirements are specified:
1. Architectural Woodwork Standards, Edition 1, 2009, adopted and published jointly by AWI, AWMAC and WI.
2. ANSI/NEMA LD3 for laminates.

1.03 QUALITY ASSURANCES

A. Applicable Standard: Perform work in accordance with Architectural Woodwork Standards, Edition 1, 2009, adopted and published jointly by AWI, AWMAC and WI (formerly Woodwork Institute of California – WIC). Provide Custom when not otherwise indicated.

B. Qualifications: Manufacturer shall be company specializing in manufacturing the products specified in this Section with minimum 2 years documented experience.

C. Mock-up: Provide mock-up of full size base cabinet and upper cabinet for approval.
1. Provide units with specified counter top, with hardware installed.
2. Units will be examined to ascertain quality and conformity to quality level standards and Specification requirements.
3. Mock-up may remain as part of the Work, if accepted by the Architect.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage and moisture while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

1.05 PROJECT CONDITIONS

A. Physical Requirements for Proper Installation or Application: Provide humidity conditions which will prevent damage to woodwork.

B. Verify that field measurements are as indicated on Shop Drawings.

PART 2 PRODUCTS

2.01 MANUFACTURERS - PLASTIC LAMINATE

A. Furnish plastic products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
1. Wilsonart www.wilsonart.com
2. Formica www.formica.com
3. Nevamar www.nevamar.com
4. Laminart www.laminart.com
5. Pionite www.pionite.com

2.02 MATERIALS AND ACCESSORIES – GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Wood and agrifiber products must contain no added urea-formaldehyde resins in accordance with the requirements of "Low Emitting Materials" as specified in Section 01 60 00 - Materials and Equipment.

2.03 WOOD MATERIALS

A. Hardwood Lumber:
a. Custom Grade in accordance with applicable standard specified herein under "Quality Assurance," average moisture content of 6 percent.
b. Species and Cut: As indicated on Drawings.

2.04 SHEET MATERIALS

A. Hardwood Plywood: Core materials of veneer, type of glue recommended for application; face veneer and cuts As indicated on Drawings.
1. Baltic Plywood shall be used in the construction of drawers and cabinet doors, including those to have plastic laminate finish.
2. Wood and agrifiber products must contain no added urea-formaldehyde resins in accordance with the requirements of "Low Emitting Materials" as specified in Section 01 60 00 - Materials and Equipment.
3. Adhesives shall be In accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

B. Softwood Plywood: DOC PS 1, MDO (Medium Density Overlay), or other overlay plywood product suitable for application of plastic laminate as approved by the Architect.
1. Baltic Plywood shall be used in the construction of drawers and cabinet doors, including those to have plastic laminate finish.
2. Wood and agrifiber products must contain no added urea-formaldehyde resins in accordance with the requirements of "Low Emitting Materials" as specified in Section 01 60 00 - Materials and Equipment.
3. Adhesives shall be In accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

C. Wood Particleboard: Not used.

D. Hardboard: Not used.

E. Medium Density Fiberboard (MDF): Not used.

2.05 LAMINATE MATERIALS

A. Plastic Laminate: High pressure decorative type.
1. Horizontal Grade: NEMA LD-3, Grade GP50, .050 inch thickness.
2. Vertical Grade: NEMA LD-3, Grade GP28, (.028 inch thickness). This grade of laminate shall be counterbalanced.
3. Post Forming Grade: NEMA LD-3, Grade PF 42.
4. Cabinet Liner Grade: NEMA LD-3, Grade CL-20, (.020 inch thickness). This grade of laminate shall be counterbalanced.
5. Melamine: Not acceptable for this project.
6. Backer: NEMA LD-3, Grade BK-20 (.020 inch thickness).
7. Finishes, Colors and Patterns: As indicated on Drawings.

2.06 ACCESSORIES

A. Adhesive: Type recommended by Laminate Manufacturer to suit application and as follows.
1. In accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.
2. PVA (polyvinyl acetate) or MDI (polyisocyanurate) adhesive shall be used.

B. Wall Adhesive:
1. Cartridge type compatible with paneling and wall substrate.
2. In accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

C. Edge Trim: Extruded convex or flat shaped plastic as indicated on Drawings; smooth finish, self locking serrated tongue, of width to match components thickness, color as selected or noted on Drawings.

D. Glass: As specified in Section 08 80 00.

E. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application. Threaded steel for concealed joints.

2.07 HARDWARE

A. Shelf Standards and Supports for Cabinet Mounted Shelving: K&V 255 standards and 256 supports.

B. Shelf Standard and Brackets for Wall Mounted Shelving: K&V 85 Double-Slot Wall Standard and No. 185 Double-Flange Wall Brackets.

C. Shelf Support Pins: K&V 333, 7/32 inch diameter shelf pins.

D. Drawer and Door Pulls: Stainless steel wire pull type.

E. Sliding Door Pulls: Grant 426

F. Catches: Stanley 41 or K&V 43.

G. Drawer Slides: Conforming to ANSI/BIFMA X5.6, UL 1678 and UL 1286.
1. Light and medium duty drawers -24 inch wide or less: Accuride 7432 ball bearing, rail mount, full extension slides with 100 lb./pr. load rating. Provide Accuride 7434 overtravel slides where drawers require full access.
2. Heavy duty drawers - 42 in wide or less: Accuride 3640 ball bearing, rail mount, full extension slides plus 1 inch (25mm) overtravel with 200 lb./pr. load rating.
3. Finish: Clear zinc.

H. Cabinet Hinges: Rockford Process Control, 851 overlay bushed stainless steel.

I. Sliding Door Track Assemblies: Grant 600 Series.

J. Locks: National C8138 for drawings, Nation 8123 for doors.

K. Finish: Brushed chrome or similar as selected by Architect.

2.08 FINISHING MATERIALS

A. Finishing Materials: As specified in Section 09 91 00.

2.09 FABRICATION

A. Fabricate architectural woodwork and cabinets in conformance with Premium Grade Standards in accordance with applicable standard specified herein under "Quality Assurance."

B. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

C. Cap shelves, doors, and other exposed edges with edging to match cabinet face. Use one piece for full length only.

D. Sides, bottoms, backs and doors are to be 3/4 inch exterior glue plywood with plastic laminated on all exposed sides.

E. Shelves: Fabricate shelves with 3/4 inch thick exterior rated plywood covered on both sides with plastic laminated, edge faced with 1-1/4 inch banding, and adjustable.

F. Shelf Standards within Casework: Set shelf standards within recessed groove of same width and depth as shelf standard.

G. Countertops:
1. Stainless Steel: In accordance with Section 05 70 00. Subtop to be 3/4 inch plywood.
2. Plastic Laminate Faced Countertops: Fabricated plastic laminate faced countertops with separate back splash and separate side splashes with integral scribe for fitting to wall.
a. Countertop Edge Treatment: Square edge.
b. Locate counter butt joints minimum 2 feet from sink cut-outs.

H. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

I. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arrises. .

J. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

K. Provide cutouts for appliances, outlet boxes, fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

L. District Map: A smooth wall surface 10'-0" by 10'-0" shall be constructed of 3/4 inch plywood, edge banded and joints sealed, painted white to take sizing/paper shall be provided for district map as noted on Drawings.

M. Workbench: Provide 30 inch by 8'-0" work bench construed with a solid 1-1/2 inch thick hardwood top covered with galvanized sheet metal. A storage base cabinet with doors mounted on Rockford Process Control 851 overlay hinges and drawers on heavy duty glides shall be provided below the work bench. Upper cabinet shall be provided. A space with backing shall be provided for 5" mounting, heavy duty vise (Owner furnished – Owner-installed) on workbench top.

N. Sleeping Areas:
1. Desktops are to be built into each room.
    1. Crew rooms are to have 30 inch desktop units.
    2. Captains: Provide 5'-0" desk with file drawer and pencil drawer.
    3. Battalion Chief (if applicable): Provide 6'-0" deck in office with drawers on each side and pencil drawer.
2. Bed pedestal base units are to be provided with 3 full sliding drawings under them.

2.10 SHOP FINISHING

A. Sand Work smooth and set exposed fasteners; apply wood filler.

B. Apply wood filler in exposed nail and fastener indentations. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and types recommended for applied finishes.

C. Finish work in the factory in accordance with finish system #9 in accordance with "Architectural Woodwork Standards Section 5 - " Finishing."

D. Seal surfaces in contact with cementitious materials.

E. Seal internal surfaces of cabinets with two coats of sealer, except where cabinets are constructed of prefinished plywood or finished internally with cabinet liner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Set and secure cabinetry and other woodwork in place; rigid, plumb and level, and in accordance with applicable standard specified herein under "Quality Assurance" for grade of work specified.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Secure and align adjoining cabinet units and counter tops with concealed joint fasteners.

D. Scribe casework abutting other components, with maximum gaps of 1/32 inch (0.03125 inch). Do not use additional overlay trim for this purpose.

E. Secure cabinet and bases to floor using appropriate angles and anchorages.

F. Where exposed anchors or fasteners are unavoidable in the finish Work, countersink anchorage devices at exposed locations and conceal with plastic or laminate faced plugs to match surrounding plastic laminate, finish flush with surrounding surfaces.

G. Install trim in single lengths without splices where possible. Miter external corners and cope internal corners.

3.03 FIELD FINISHING

A. Sand Work smooth and set exposed fasteners.

B. Prime, fill, and finish Work of this Section in accordance with Section 09 91 00.

3.04 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 06 61 16

SOLID POLYMER FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Provide solid surface countertops at toilet rooms and bathrooms.

1.02 SUBMITTALS

A. Product Data: Indicate product description, fabrication information and compliance with specified performance requirements.

B. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.

C. Samples: Submit minimum 6 inches x 6 inches samples. Indicate full range of color and pattern variation. Approved samples will be retained as a standard for work.

D. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions.

E. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications:
1. Subject to approval by Architect and Resident Engineer.
2. Have adequate physical facilities and sufficient production capacity to produce, transport, deliver, and install the required units without causing delay in the work.
3. Have a minimum of 2 years of fabrication experience.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to project site until areas are ready for installation. Store indoors in a dry area and away from extreme temperatures.

B. Deliver materials and accessory products in manufacturer's unopened containers.

C. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.05 WARRANTY

A. Provide manufacturer's standard ten year limited warranty against visible defects and failure due to manufacturing defects. Damage caused by physical or chemical abuse or damage from excessive heat is excluded from warranty. Warranty shall provide material and labor to repair or replace defective materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish plastic products of one of the following manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with Specification requirements.
   a. Corian as manufactured by Du Pont, Inc., Wilmington, DE (800) 551-2121 www.dupont.com/corian/
   b. Or equal approved by Architect and Resident Engineer.

2.02 MATERIALS

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Solid polymer fabrications:
   1. Conform to ANSI Z124-1980, Type 6 and Fed. Specification WW-P-541E/GEN (August 1, 1980).
   2. USDA approved for food preparation use.
   3. Cast, filled acrylic or polyester/acrylic blend, not coated, laminated or of composite construction.

C. Provide edge details as shown on the Drawings.

D. Exposed joints shall be in locations shown on the Drawings. Seams not indicated on the Drawings shall be unexposed and adhesively joined. Adhesive shall be in accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

E. Provide backsplashes, where shown on the Drawings, to dimensions shown on the Drawings.

F. Provide solid polymer bowls and/or lavatories, sinks in locations shown on the drawings.

G. Finish and Color(s): “Platinum” (Corian by Du Pont)

2.03 ACCESSORY PRODUCTS

A. Adhesives: Solvent free, zero VOC, nonflammable, nontoxic and acceptable to Architect and Resident Engineer for application as required by Section 01 60 00.
   1. Joint Adhesive: To create inconspicuous, non-porous joints. Color to match fabrication material.
   2. Panel Adhesive: ANSI A136.1-1967 and UL(R) listed.

B. Sealant:
   1. For conditions exposed to moisture; Manufacturer's standard mildew-resistant, FDA/UL(R) recognized silicone sealant in colors matching components.
   2. For conditions not exposed to moisture; Manufacturer's standard silicone sealant in colors matching polymer material.
   3. Sealants shall be in accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

2.04 FABRICATION

A. Factory fabricate components to greatest extent practicable to sizes and shapes indicated, in accordance with approved shop drawings.

B. Form joints between components using manufacturer's standard joint adhesive (compliant with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment); without conspicuous joints.

C. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.

D. Cut and finish component edges with clean, sharp returns. Route radii and contours to template. Repair or reject defective and inaccurate work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Install components plumb and level, scribed to adjacent finishes, in accordance with approved shop drawings and manufacturer's installation instructions.

B. Form field joints using manufacturer's recommended adhesive (compliant with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment), with joints inconspicuous in finished work. Keep components and hands clean when making joints.

C. Provide backsplashes and sidesplashes as indicated on the drawings. Adhere to countertops using manufacturer's standard color-matched silicone sealant and panel adhesive (with sealant and adhesives compliant with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment).

D. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained components.

E. Lavatories/Sinks: Make plumbing connections to sinks in accordance with applicable Division 22 Sections

3.03 PROTECTION

A. Protect surfaces from damage until Date of Substantial Completion. Repair work or replace damaged work that cannot be repaired to Architect's and Resident Engineer's satisfaction.

3.04 CLEANING

A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 06 74 13

FIBERGLASS REINFORCED GRATINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Composite (FRP Pultruded) Gratings.

1.02 SYSTEM DESCRIPTION

A. Design Requirements:
1. The design of FRP products including connections shall be in accordance with governing building codes and standards as applicable.
2. Design live loads of FRP gratings and floor panels shall not be less than 100 PSF uniformly distributed unless specifically stated otherwise in drawings and/or supplementary conditions. Grating and floor panel deflection at the center of a simple span not to exceed 0.25".
3. Structural members shall be designed to support all applied loads. Deflection in any direction shall not be more than L/180 of span for structural members. Connections shall be designed to transfer the loads.

1.03 SUBMITTALS

A. Shop drawings: Submit drawings showing fabricated pultruded gratings, supporting structural shapes and plate, and appurtenances.

B. Manufacturer's catalog data showing:
1. Dimensions, spacings, and construction of grating
2. Materials of construction

C. Detail shop drawings showing:
1. Dimensions
2. Sectional assembly
3. Location and identification mark
4. Size and type of supporting frames required

D. Samples of each type of product shall be submitted for approval prior to placement of purchase orders.

E. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.04 DELIVERY, STORAGE AND HANDLING

A. Exercise care during unloading, storage and erection to avoid damage. Dumping on the ground is not permitted.

B. Support material stored at the site completely free of the ground, and cover to avoid damage from the elements.

C. Systems, sub-systems and structures shall be shop fabricated and assembled into the largest practical size suitable for transporting.

D. Materials and equipment necessary for the fabrication and installation of pultruded gratings and appurtenances shall be stored before, during, and after shipment in a manner to prevent cracking, twisting, bending, breaking, chipping or damage of any kind to the materials or equipment, including damage due to over exposure to the sun. Any material which, in the opinion of the Architect and Resident Engineer, has become damaged as to be unfit for use, shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.

E. Identify and match-mark all materials, items and fabrications for installation and field assembly.

1.05 PROJECT/SITE CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of Shop Drawings and fabrication, where possible, to ensure proper fitting of the Work. Allow for trimming and fitting wherever the taking of field measurements before fabrication might delay the Work.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Recycled Content: Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.
3. Materials used in the manufacture of the FRP products shall be raw materials in conformance with the specification.
4. FRP products shall be manufactured using a pultruded process utilizing either polyester or vinyl ester resin with flame retardant and ultraviolet (UV) inhibitor additives. A synthetic surface veil shall be the outermost layer covering the exterior surface. The flame retardant FRP shapes shall achieve a flame spread rating of 25 or less in accordance with ASTM test method E-84.
5. After fabrication, cut ends, holes and abrasions of FRP shapes shall be sealed with a compatible resin coating.
6. Exposed surfaces shall be smooth and true to form.

B. Manufacturers:
1. McNichols, www.mcnichols.com
2. Or equal.

2.02 PULTRUDED GRATINGS

A. General
1. Grating shall be shipped from the manufacturer, palletized and banded with exposed edges protected to prevent damage in shipment.
2. Each piece shall be clearly marked showing manufacturer's applicable drawing number.

3. Grating shall be DURAGRID® Pultruded “ADA Compliant” T-Bar Fiberglass grating panels as manufactured by McNichols or equal. Bearing bar spacing shall be as indicated on Structural Drawings. Color to be as selected by Architect and Resident Engineer.

B. Design
1. The panels depth indicated on Drawings and sustain a deflection of no more than 0.25” under a uniform distributed load of 100 PSF for the span lengths shown on the plans.
2. The bearing bars shall be joined into panels by passing continuous length fiberglass pultruded cross rods through the web of each bearing bar. A continuous fiberglass pultruded bar shaped section shall be wedged between the two cross rod spacers mechanically locking the notches in the cross rod spacers to the web of the bearing bars. Continuous chemical bonding shall be achieved between the cross rod spacers and the bearing web and between the bar shaped wedge and the two cross rod spacers locking the entire panel together to give a panel that resists twist and prevents internal movement of the bearing bars.
3. The top surface of all panels shall have a non-skid grit affixed to the surface by an epoxy resin followed by a top coat of epoxy resin.
4. Panels shall be fabricated to the sizes shown on the drawings.
5. Hold down clamps shall be type 316L stainless steel insert hold downs as provided by grating manufacturer. Use 2 at each support with a minimum of 4 per panel.

C. Products:
1. The FRP grating and stair treads shall be fabricated from bearing bars and cross rods manufactured by the pultrusion process. The glass fiber reinforcement for the bearing bars shall be a core of continuous glass strand rovings wrapped with continuous strand glass mat. A synthetic surface veil shall be the outermost layer covering the exterior surfaces.
2. Fiberglass grating and stair treads shall be made from a chemical resistant, fire retardant polyester or vinyl ester resin system with antimony trioxide added to meet the flame spread rating of 25 or less in accordance with ASTM E-84 testing and meet the self-extinguishing requirements of ASTM D-635. UV inhibitors are added to the resin.
3. Cut and machined edges, holes and abrasions shall be sealed with a resin compatible with the resin matrix used in the bearing bars and cross rods.
4. Panels shall be fabricated to the sizes shown on the approved shop drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from infiltration of water and debris.

3.03 INSTALLATION, GENERAL:

A. Install items specified as indicated and in accordance with manufacturer's instructions.

B. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous FRP fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as determined by the Engineer.

C. Cutting, fitting and placement: Perform cutting, drilling and fitting required for installation of miscellaneous FRP fabrications. Set FRP fabrication accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; measured from established lines and levels.

D. Provide temporary bracing or anchors in form work for items that are to be built into concrete masonry or similar construction.

E. Field cut and drilled edges, holes and abrasions shall be sealed with a catalyzed resin compatible with the original resin as recommended by the manufacturer.

3.05 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 07 11 13

BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Damproofing at retaining walls, planters and other locations that do not have occupied living space adjacent to opposite side of wall

1.02 SUBMITTALS

A. Product Data: Submit Manufacturer's data, installation instructions, limitations and recommendations. Include certification of data indicating VOC content of components.

B. Samples: Submit samples of membrane and protection board.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Applicator Qualifications: Minimum 2 years' experience with Projects of similar scope and complexity. Applicator shall be approved by Manufacturer.

B. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this Work with related and adjacent Work. Agenda for meeting shall include review of special details and flashing.

C. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the Manufacturer on-site periodically during dampproofing work to review installation procedures.

1.04 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered in Manufacturer's original unopened packages with Manufacturer's labels intact.

B. Material shall be protected from rain and physical damage. Store materials away from sparks or flames. Store membrane where it will not exceed 90 degrees F. for extended periods.

C. Outdoors, place cartons on raised pallets and cover completely. Follow Manufacturer's directions.

1.05 PROJECT/SITE CONDITIONS

A. Perform Work only when existing and forecasted weather conditions are within the limits established by the Manufacturer of the materials and products used.

B. Proceed with installation only when substrate construction and preparation Work is complete and in condition to receive dampproofing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Dampproofing Membrane: Cold-applied, emulsified-asphalt damproofing complying with ASTM D1227, Type III, Class 1, spray applied. Provide one of the products by one of the following manufacturers, subject to compliance with specification requirements:
1. HE788 - Non-Fbr Asph Emul Dmpprfng, Henry Company www.henry.com
2. Karnak #100 Non-Fibered Emulsion Dampproofing, Karnak Corporation www.karnakcorp.com
3. Hydrocide 600, Sonneborn, Div. Of ChemRex, Inc. www.masterbuilders.com
4. Dehydratine 75, Tamms Industries www.tamms.com
5. Sealmastic Emulsion Type I, W.R. Meadows, Inc. www.wrmeadows.com
6. Or equal.

B. Protection Material: One inch thick expanded polystyrene.

PART 3 EXECUTION

3.01 EXAMINATION

A. The installer shall examine conditions of substrates and other conditions under which this Work is to be performed and notify Contractor, in writing, of circumstances detrimental to the proper completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected.

3.02 PREPARATION OF SUBSTRATES

A. Surface Preparation: All surfaces to be coated shall be structural sound, clean, free of dust, dirt, mortar, residue, curing and parting compounds, and other contaminates.
1. Clean surfaces by use of wire brush, sandblasting or mechanical means as recommended by the dampproofing manufacturer.
2. Seal voids and cracks in surface as recommended by dampproofing manufacturer. Use cement mortar, Fibered emulsion mastic, or other fillers and sealants compatible with asphalt emulsion dampproofing and approved by dampproofing manufacturer.
3. Dampen dry surfaces with water and keep damp prior to application as recommended by dampproofing manufacturer.
4. Dampproofing may be applied to damp or green concrete surfaces as approved by the manufacturer.
5. Masonry Substrates: Assure mortar joints are smooth and flush with masonry surface. Apply parge coat as recommended by dampproofing manufacturer to achieve smooth acceptable surface and forming a cove at the joint between wall and footing.

B. Related Materials: Treat joints and install flashings as recommended by Dampproofing Manufacturer.

3.03 INSTALLATION

A. Application, General: Comply with Manufacturer's literature for recommendations on installation, including but not limited to, the following:
   1. Apply by spray application at rate recommended by manufacturer in continuous unbroken film, free of pinholes, filling and spreading around all joints, slots, grooves and penetrating into all crevices, chases, reveals, soffits, and corners.
   2. Carry coating over exposed footing's top and outside edges and up vertical wall to finished grade line.
   3. Recoat areas not dampproofed if contaminated by dust.
   4. Mask and protect adjoining exposed finish surfaces.

B. Concrete and Other Dense Surfaces: Apply dampproofing in single coat application at rate recommended by manufacturer.

C. Concrete Masonry Surfaces: Apply dampproofing in two coat application.
   1. Apply prime coat of asphalt emulsion dampproofing diluted with clean, cool water at rate recommended by manufacturer.
   2. Allow prime coat to dry to the point where it is tacky to the touch prior to application of second coat.
   3. Apply dampproofing top or second coat at rate recommended by manufacturer.

D. Protection Materials: Apply protection board or sheet and related materials in accordance with Manufacturer's recommendations.

E. Allow dampproofing to cure minimum time as recommended by manufacturer prior to backfilling.

3.04 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 07 17 16

BENTONITE/HDPE SHEET WATERPROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Waterproofing at concrete elevator pit as specified and as detailed on Drawings.
2. Work includes all applicable sealants, waterstops and waterproofing flashings needed to ensure a complete waterproof system for buried concrete and masonry components at locations indicated.

1.02 SUBMITTALS

A. Product Data: Submit Manufacturer's data, installation instructions, limitations and recommendations. Include certification of data indicating VOC content of components.

B. Samples: Submit samples of membrane, protection board and composite drainage material.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Applicator Qualifications:
1. Minimum 2 years experience with Projects of similar scope and complexity.
2. Applicator shall be approved by Membrane Manufacturer.
3. Applicator shall furnish written evidence that applicator is currently approved by manufacturer to install the products required or specified for this project.

B. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this Work with related and adjacent Work. Agenda for meeting shall include review of special details and flashing.

C. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the Manufacturer on-site periodically to review waterproofing installation procedures.

1.04 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered in Manufacturer's original unopened packages with Manufacturer's labels intact.

B. Material shall be protected from rain and physical damage. Store materials away from sparks or flames. Store membrane where it will not receive high temperature exposure for extended periods of time.

C. Outdoors, place cartons on raised pallets and cover completely. Follow Manufacturer's directions.

1.05 PROJECT/SITE CONDITIONS

A. Perform Work only when existing and forecasted weather conditions are within the limits established by the Manufacturer of the materials and products used.

B. Proceed with installation only when substrate construction and preparation Work is complete and in condition to receive sheet membrane waterproofing.
1. Where work of this Section will be installed on earth, provide subgrades that are stable, smoothed and compacted to minimum 85 percent modified proctor density.
2. Where work of this Section will be installed on earth retaining system, fill gaps and voids in earth retaining system to conform with waterproofing manufacturer's requirements; fill voids and cavities exterior of wood-lagged shoring with sand or cement slurry; remove nails in wood lagging.
3. Where work of this Section will be installed on concrete or masonry, provide substrates that are free of voids deeper than 3/8" and free of surface protrusions more than 1/4" above the surface.
4. Where work of this Section will be installed on concrete footings, provide wood float or better finish to surfaces scheduled to receive the membrane.
5. Where work of this Section will include bentonite waterstop strips, provide concrete surfaces as required for that installation.
6. Rigidly install penetrations of membrane for detailing procedures.

1.06 WARRANTY

A. Provide signed copies of the following written warranties against defective materials and workmanship for a period of ten (10) years following date of substantial completion. Warrant that installed waterproofing system shall be free of defects including waterproofing failure resulting from substrate cracking up to 1/8 inch.
1. Manufacturer's standard warranty covering materials.
2. Applicator's standard warranty covering workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Specifications are based upon Paraseal LG and accessory products as manufactured by Tremco Incorporated Sealant/Weatherproofing Division. www.tremcosealants.com or equal.

B. Obtain primary waterproofing materials of each type required from a single manufacturer to the greatest extent possible. Provide accessory materials that are approved by membrane manufacturer.

2.02 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Waterproof Membrane: Dual-waterproofing, resealable, composite sheet membrane of high-density polyethylene with sodium-bentonite face and additional protective laminate layer of spun polypropylene having the following minimum attributes:
   1. Puncture Resistance: 169 lbs. in accordance with ASTM E154
   2. Tensile Strength: 4,000 psi in accordance with ASTM D412.
   3. Ultimate Elongation: 700 percent in accordance with ASTM D638, Type 4 Dumbbell.
   4. Permeance: 0.03 perms in accordance with ASTM E96.

C. Accessories: As furnished or recommended by Membrane Manufacturer.
   1. Fasteners:
      a. Case-hardened steel nail with fluted shank having a minimum 1" length and a minimum 1" diameter cap for use on green concrete and masonry substrates.
      b. Powder shot steel pin having a minimum 3/4" diameter washer for use on hardened concrete and grouted masonry substrates.
      c. Steel staples approved by membrane manufacturer for use according to Project conditions.
   2. Granular Bentonite: “Paragranular,” loose sodium-bentonite granules or equal for detailing horizontal-to-vertical junctures, capable of swelling to occupy a minimum volume of 17 ml when 2 grams are dispersed in deionized water.
   3. Non-hydrated expandable mastic: “Paramastic,” trowelable consistency or equal for detailing vertical junctures and penetrations, containing not less than 55 percent high swelling Wyoming sodium bentonite.
   4. Seam Tape:
      a. "Temporary Tape" reinforced temporary joint closure tape 3" wide composed of acrylic adhesive bonded to polyvinyl chloride coated fabric (or equal) used to protect seams against debris intrusion during backfill and for temporary terminations during periods of exposure to rain.
      b. "Permanent Seam Tape" reinforced, rubberized-asphaltic waterproofing seam tape 4" wide by 60 mils thick (or equal) for sealing membrane overlaps wherever flood-testing is required and elsewhere as required by Project conditions or designs.
      c. "Para JT Tape" non-reinforced, adhesive tape of partially cross-linked polymeric elastomers 2" wide by 1/8" thick (or equal) for molding form-fit seals around difficult contours and for taping seams within overlaps.
   5. Termination Bar: “Paraterm Bar” Extruded aluminum bar with upper flange (or equal) to receive sealant bead.
   6. Sealant for completing termination seals and other sealing recommended by manufacturer: "Dymonic 100" one-part gun-grade polyurethane or equal.
   7. Liquid-applied, elastomeric waterproofing flashing: "TREMproof 201/60 polyurethane or equal.
   8. Wrapping through-concrete imbeds and other detailing: "Parastick'N'Dry" pressure sensitive, double-sided tape laminate of bentonite sandwiched between a netting and non-woven fabric or equal.
   9. Material for sealing static cold joints in concrete: "Superstop" flexible, reinforced, bentonite-laminate waterstop strips 1/2" by 1" by 20' -0" with pressure-sensitive adhesive backing or equal.
   10. Primer for tapes and pressure-sensitive waterproofing accessories: "Paraprimer" versatile adhesive bonding agent primer or equal.
   11. Drainage mat: As approved by waterproof membrane manufacturer from the TREMDrain series of products such as TREMDrain, TREMDrain 1000, TREMDrain 2000 or equal composed of a filter fabric laminated to free-draining high-density dimpled polystrene drainage core.

12. Drainage piping: TREMDrain Total-Drain or equal shall replace the usage of perforated pipe and aggregate connect directly to the approved Tremco Inc. TREMDrain product.
13. Hydration barrier below concrete floor slab: Vapor barrier membrane as specified in Section 03 30 00 – Cast-in-Place Concrete.
14. Protection course: As recommended by the waterproof system manufacturer.

D. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the membrane system manufacturer as compatible, subject to review of the Architect and Resident Engineer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination:
1. Coordinate with other work which affects, connects with, or will be concealed by this Work.
2. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section and to prevent damage to installed waterproofing.

C. Applicator shall examine the areas and conditions under which work of this Section will be performed.
1. Verify conformance with manufacturer's requirements;
2. Report unsatisfactory conditions in writing to the Architect and Resident Engineer;
3. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION OF SUBSTRATES

A. Refer to Manufacturer's literature for requirements for preparation of substrates. Use repair materials and methods which are acceptable to Manufacturer of sheet membrane waterproofing.
1. Comply with waterproofing system manufacturer's instructions except where more stringent requirements are indicated or specified.
2. Lay out project to determine and anticipate conditions prior to start of work.
3. Note termination and penetration conditions to determine methods for creating a waterproof envelope. Verify that where below-grade waterproofing extends to grade, other waterproofing provides for substrate continuing above grade.

3.03 INSTALLATION

A. Refer to Manufacturer's literature for recommendations on installation and details on Drawings (based upon Tremco BSOG-28), including but not limited to, the following:
1. Place membrane in manner that assures minimum handling.
2. Fit closely to and seal around inlets, outlets and other penetrations.
3. Press membrane tight to corner surfaces and securely fasten.
4. Terminate membrane system with termination bar finished off with bead of sealant or terminate to liquid membrane using waterproofing seam tape.

B. Provide treated plywood at vertical locations within elevator shaft as detailed.

C. Provide TREMDRAIN at bottom of elevator shaft as detailed.

D. Vertical Surfaces: Install membrane sheets in vertical lifts with HDPE-side facing applicator to prepared surfaces conforming to manufacturer's requirements and as detailed on Drawings.
1. Fastening and overlaps:
   a. Securely fasten membrane 12 inches on center along top edge with sheet extending out onto footing surfaces 6 inches minimum.
   b. Install subsequent membrane sheets to overlap previous sheets 1-1/2 inches minimum.
   c. Securely fasten membrane 24 inches on center through both sheets at overlaps.
   d. Securely fasten 18 inches on center to tops of footing surfaces and horizontal shelves.
   d. Apply seam tap to seam overlaps.
2. Waterproof penetration in accord with manufacturer's recommendations

E. Horizontal Surfaces:
1. Install membrane with bentonite-side down against deck surfaces with edges overlapped minimum 1-1/2 inches in shingle fashion with staggered end laps and as detailed on Drawings.
2. Start installation at lowest point.
3. Tape seams with reinforced waterproofing seam tape closely following membrane placement in immediately secure by roll-pressing with hand-held metal seam roller.
4. Waterproof penetrations, drains, and horizontal-to-vertical junctures with liquid membrane carrier out onto deck surfaces 12 inches. Overlap cured liquid membrane flashing 6 inches with membrane sheet and seal overlap with waterproofing seam tape.

F. Provide material for sealing static cold joints in concrete at cold joints between horizontal concrete and vertical concrete.

G. At the end of each working day, water cut-offs must be installed to protect against water penetration under installed membrane. Temporary water cut-offs shall be removed before Work is resumed. Seal daily terminations with a trowelled bead of elastomeric membrane.

H. Where metal edging occurs set flanges in mastic and secure as shown on Drawings. Strip in with membrane.

3.04 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

3.05 PROTECTION

A. Ensure membrane is protected from damage caused by subsequent construction operations.

B. Inspect and repair damage material immediately before final covering.

END OF SECTION

SECTION 07 18 13

PEDESTRIAN TRAFFIC COATING
(Deck Coating)

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Waterproof coating system (deck coating) at above grade concrete deck.

1.02 QUALITY ASSURANCE

A. Installer Qualifications: Perform work employing a factory-authorized installer. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of the Work.

B. Pre-Installation Conference: Prior to commencement of the traffic coating work, schedule a meeting at a mutually agreeable time to include the Architect and Resident Engineer, Contractor, Contractor's field superintendent, traffic coating installer, traffic coating materials manufacturer's representative, and other appropriate interested parties to review methods and procedures to be used.

C. Regulatory Requirements: Comply with VOC regulations.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings and manufacturer's data for the following items:
1. Outline of area to receive traffic coating system.
2. Locations, details and types of penetrations.
3. Perimeter and vertical details.
4. Perimeter and expansion joint locations.

B. Samples: Submit samples of manufacturer's standard colors.

C. Installer Qualifications and Approval of Conditions: Applicator shall be approved by the Manufacturer. Manufacturer and applicator shall verify that the substrate and the details are proper and adequate for the materials being furnished.

D. Installation Report: At completion of Work, manufacturer's representative shall write report on installation summarizing installation and certifying that installation meets manufacturer's requirements for properly functioning system with no leaks.

E. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with manufacturer's instructions.

1.05 WARRANTY

A. Provide manufacturer's standard written warranty that traffic coating system will remain watertight for a period of 5 years. Upon notification of defects within warranty period, make necessary repairs and replacements at the convenience of the Owner. Repairs and replacements shall include resultant damage to adjacent materials, systems and equipment.

1.06 PROJECT CONDITIONS

A. Environmental Requirements: Apply components of the traffic coating system at surface and ambient temperatures of 40^{O} F. or above with fair, dry weather conditions. For applications below 40^{O} F., follow membrane manufacturers written instructions. Do not apply surface coatings and adhesives when rain is expected within two hours.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide products as manufactured by one of the following, subject to conformance with specfications:
1. Gaco Western (800) 456-4226 www.gaco.com
2. Neogard, (214) 353-1689 www.neogard.com
3. Or equal.

2.02 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Gaco Western GacoDeck GW-14U or equal:
1. Primer: As recommended by manufacturer.
2. Sheet Flashing; Gaco Western NF-621 elastomeric sheet flashing material having a minimum thickness of 60 mils or equal.
3. Liquid Flashing: Gaco Western UB-64 polyurethane coating or equal.
4. Aggregate: Shelfil 18/40 or equal.
5. Coating: Gaco Western UB 64 or equal, color to be as selected by Architect and Resident Engineer.
6. Sealant: Sonneborn NP-1, SikaFlex A-1 or equal.
7. Reinforcing Tape: Gaco Western 66-B or equal.

C. Neogard Peda Gard II.
1. Primer: As recommended by manufacturer.
2. Sheet Flashing; Elastomeric sheet flashing material having a minimum thickness of 60 mils.
3. Liquid Flashing: Neogard 7400 series or 70420 series polyurethane coating or equal.
4. Aggregate: Uniformly Graded 16/30 mesh silica sand with 6.5 +.5 MOH hardness as approved by manufacturer.
5. Coating: Neogard 7400 series or 70420 series polyurethane coating or equal, color to be as selected by Architect and Resident Engineer.
6. Sealant: Neogard 70991 Sealant or equal.
7. Reinforcing Tape: As recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.
1. Verify that work of all other trades which penetrates walls and decking or requires men and equipment to transverse area prior to installation of traffic coating has been complete.
2. Surfaces: Verify that surfaces meet the requirements of the manufacturer's written specifications, as applicable, regarding concrete finishing and curing. Inspect to ensure that surfaces to receive membrane are dry, smooth, rigid, clean, frost-free, and free of voids, dirt, debris, sharp projections, grease, oil, or other contaminants.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

A. Surface Preparation: Remove dust from the surface immediately before application of primer. Repair defects prior to primer application.

B. Verify that penetrations through the surfaces to be treated are completed prior to the application of the waterproofing.

C. Concrete: If required by manufacturer's published instructions, treat concrete surfaces with 10% to 15% solution of muriatic acid to remove laitance and impurities. Rinse in accordance with manufacturer's instructions. Following thorough drying of the surface, apply primer and sealer coats as required by the manufacturer.

D. Cracks and Cold Joints: Visible cracks, up to 1/16" in width shall be cleaned, primed and treated with polyurethane deck coating material a minimum distance of 2" on each side of the crack to yield a total thickness of 30 dry mils. Large cracks shall be routed and sealed with Gaco Western UB-64 and 66-B tape or Neogard 70991 and reinforcing tape.

E. Metal surfaces: Mechanically clean and wipe with Xylol, then prime with manufacturer's recommended primer.

F. Exposed metal projections: Prepare in accordance with manufacturer's printed details.

G. Joints and Edge Detailing: Apply 10 mil by 6 inch wide detail coat of specified Coating at all joints. Allow to tack. Place specified Reinforcing Fabric in Coating as shown in manufacturer's details.

3.03 INSTALLATION

A. General: Install the work of this Section in accordance with manufacturer's written instructions and recommendations. Provide nominal 42 mil system, including aggregate.

B. Apply primer at rate recommended by manufacturer to produce shiny surface. Primer may be re-coated when material has slight tack, but can no longer be lifted from surface. Allow to cure overnight. Reprime if left exposed for 24 hours.

C. Apply reinforcing in detail coat of coating over control joints and cracks exceeding 1/16 inch. Allow to tack prior to placing reinforcing fabric.

D. Apply base coat of traffic coating at 1-1/4 to 1-1/2 gallons per 100 square feet. Allow to cure.

E. Apply wearing surface coat over cured base coat at one gallon per 100 square feet. Broadcast aggregate to fluid material. (Approximately 20 lbs. per 100 square feet for silica sand; 6 to 8 lbs. per 100 square feet for Shelfil.) Broadcast aggregate within 30 minutes of applying coating. Allow to cure.

F. Apply lock coat of coating at a rate of one gallon per 100 square feet. Allow minimum of 24 hour cure before subjecting system to traffic.

G. Deck coating system shall be turned up at vertical wall 2 to 4 inches as indicated on Drawings and in accordance with manufacturer’s standard details to provide integral wall base.

3.04 FIELD QUALITY CONTROL

A. Arrange for manufacturer's representative to inspect membrane thoroughly before covering. Make necessary corrections immediately.

B. Provide for at least one interim inspection by the manufacturer's representative prior to application of aggregate.

C. Completed traffic coating system shall be inspected by manufacturer's representative and accompanied by Contractor who shall assist as required to provide inspection of system.

3.05 CLEANING

A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 07 19 00

WATER REPELLENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Water repellent coating for masonry and concrete exposed to exterior.

1.02 DEFINITIONS

A. Water Repellent: Resistant to penetration of water from rainfall.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: The application of water repellent shall provide finished surfaces uniform in color without altering the natural texture of the substrate, and shall resist water penetration from rainfall.

1.04 SUBMITTALS

A. Product Data: Submit recommended method of application and coverage rate.

B. Samples: Submit samples of coating applied to materials used in the Project for review of the aesthetics, and effectiveness, accompanied with a letter stating the actual application rates required.
   1. Manufacturer shall procure and apply system to samples of the masonry units to be used in the structure which will be reviewed by the Architect and Resident Engineer for both aesthetics and effectiveness.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be able to show evidence that the firm has been engaged in producing such material for at least 2 years and that the product has a satisfactory field performance.

B. Applicator Qualifications: Applicators shall be trained, approved and accepted by the Manufacturer and have a minimum of 2 years experience spraying specialty coatings.

C. Regulatory Requirements: Comply with volatile organic compound (VOC) regulations in effect within the jurisdiction of the Project site.

D. Mock-ups:
   1. Apply water repellent to sample wall located at the job site using the identical procedures which will be used in making application of material on the remainder of the Project.
   2. The purpose of this sample will be to observe color uniformity and intensity, the method of application, including workmanship techniques and to water test surface after a 30 day period.
   3. Equipment to be used for actual application to building walls shall be used to apply materials to sample wall.
   4. The sample, when approved by the Architect and Resident Engineer, will function as a reference base for acceptance or rejection of color.

E. Pre-Installation Conference: A representative of the manufacturer shall be present prior to and at the beginning of job application to review the work with the Architect and Resident Engineer and the Contractor. At this conference the manufacturer's representative shall also approve the wall and the suitability of the weather.

1.06 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Delivery shall be made to the job site in Manufacturer's original containers with seals unbroken and labeled with Manufacturer's batch number.

B. Storage and Protection: Store materials in original, unopened containers in compliance with Manufacturer's printed instructions and protect from damage.

1.07 PROJECT CONDITIONS

A. Physical Requirements for Proper Installation or Application: Temperature and relative humidity conditions for a period before, during, and after application shall be as recommended by the Manufacturer. If rain occurs, allow surfaces to dry a minimum of 5 days.

1.08 WARRANTY

A. Manufacturer shall provide a standard written warranty for a period of 5 years from date of project completion.
   1. Written warranty shall include the following provisions:
      a. Coating will act as a water repellent for the full warranty period.
      b. Coating will not peel or flake for the full warranty period.
   2. Upon satisfactory completion of the installation, and as a condition of its acceptance, the warranty shall be delivered to the Owner.
   3. If at any time during the warranty period, any such failure occurs resulting from ordinary weather conditions in any area to which the coating has been properly applied, the manufacturer shall agree to supply all material needed to repair such affected areas at no additional cost.

B. The applicator shall guarantee the installation against poor workmanship for a period of 2 years from the date of Substantial Completion. Applicator shall make necessary repairs without charge to Owner during that period. Manufacturer shall guarantee material against moisture penetration for 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following Manufacturers, subject to compliance with Specification requirements:
   1. Chemprobe Coating Systems, L.P.; Division of Tnemec Co., Inc. (represented by Teri Hand, (480) 951-8686) www.tnemec.com
   2. Diedrich Technologies, Inc. (represented by Lanton Associates, Anthony Evans (480) 303-9182. www.diedrichtechnologies.com
   3. Degussa Corporation, (represented by PCI Services, (480) 343-3030, (480) 828-8827) (800) (800) 828-0919 www.degussa.com
   4. ProSoCo., Inc. www.prosoco.com
   5. Rainguard Products Company (represented by Syd Bell (480) 893-3252 or (800) 898-3252). www.rainguard.com
   6. Tamms Industries, Inc. (represented by Lisa Zeller (602) 431-0292. www.tamms.com
   7. Or equal.

2.02 MATERIALS AND ACCESSORIES

A. Water Repellent Sealer: Provide either silane or siloxane compounds (not a combination). The following are acceptable.
1. Silanes:
a. Weather Seal SL100; ProSoCo, Inc.
b. Regular or Super, Rainguard Products Company.
c. Blok-Lok, Rainguard Products Company.
d. Aqua-Trete EM, Degussa Corporation.
e. Or equal.
2. Siloxanes:
a. Prime A Pell H_2O; Chemprobe Technologies, Inc.
b. WeatherSeal Siloxane WB; ProSoCo, Inc.
c. Baracade ME; Tamms Industries Co.
d. Diedrich 300-C, Diedrich Technologies, Inc.
e. Micro-Seal Concentrate, Rainguard Products Company.
f. Or equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
1. Carefully inspect the installed Work of other Trades, and verify that such Work is complete to the point where water repellent application may commence.
2. The Manufacturer's representative shall verify that the water repellent can be applied in accordance with the Manufacturer's recommendations.
3. Verify that cracks which exceed 1/64 inch (0.40mm) wide have been filled with pointing mortar or caulking material. Defective mortar joints shall be routed out, pointed with mortar and tooled.
4. Verify that flashing and caulking materials have been installed properly.
5. Verify that masonry has been cleaned as specified in Section 04 01 20.52.

3.02 PREPARATION

A. Protection:
1. Use all means necessary to protect clear water repellent before, during, and after installation and to protect the installed Work of other Trades.
2. Metal, glass and other such items shall be protected by suitable masking materials to protect against overspray.
3. In the event of damage, immediately make repairs and replacements necessary as acceptable to the Architect and Resident Engineer.
4. Protect concrete sidewalks from runoff by soaking with water immediately prior to application on adjacent walls.

B. Surface Preparation:
1. Allow walls to cure at least 30 days before clear water repellent is applied.
2. Walls shall be free of excess mortar.
3. Follow Manufacturer's instructions regarding allowable moisture level.

3.03 APPLICATION

A. Water Repellent: Apply in accordance with Manufacturer's printed directions.

B. Coverage:
1. At no time shall rate of coverage be less than required by Manufacturer's directions.
2. Applicator shall make proper material allowance based upon substrate when determining quantities of material.

3.04 SURFACES TO BE COATED

A. Exterior exposed masonry and concrete surfaces. – VERTICAL WALLS.

B. Exposed tops of masonry and concrete walls including parapets, fence/screen walls, planter walls, etc. - HORIZONTAL SURFACES.

C. Roof side of exposed masonry and concrete parapet walls, lapping flashing - VERTICAL WALLS.

D. Planter side of planter walls, lapping waterproofing (07 14 16) and soil - VERTICAL SURFACES.

E. Other locations as indicated on Drawings.

3.05 FIELD QUALITY CONTROL

A. Tests:
1. Twenty days after completion of this portion of the Work, and as a condition of its acceptance, demonstrate by running water test that the Work of this Section will successfully repel water.
2. Notify the Architect and Resident Engineer and Manufacturer at least 72 hours in advance and conduct the test in the presence of Architect and Resident Engineer and manufacturer's representative.
3. By means of an outrigger or similar acceptable equipment, place 3/4 inch garden hose with garden type spray nozzle, at a point designated by the Architect and Resident Engineer, 8 feet to 10 feet away from the wall, aiming the nozzle so that water will strike the wall at a 45 degree downward angle.
4. Run the water onto the wall at full available force for not less than 4 hours. Provisions shall be made to collect the run off water into a container, and if possible to reuse it in the test
5. Upon completion of the four hour period, inspect the interior surface of the wall for evidence of moisture penetration.
6. If evidence of moisture penetration is discovered, apply an additional coat of the repellent material to the areas where leakage occurred.
7. An additional area or areas designated by the Architect and Resident Engineer shall be tested and corrected if leakage occurs.
8. Architect and Resident Engineer may require additional tests until no leakage occurs.

3.06 CLEANING

A. Clean spillage and overspray as recommended by the Manufacturer.

B. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of away from premises.

END OF SECTION

SECTION 07 21 00

BUILDING INSULATION

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Submit Manufacturer's data, installation instructions, limitations and recommendations. Include certification and test data substantiating R-Values and combustibility of each type of insulation.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements: Conform to applicable code for fire resistance ratings and surface burning characteristics.

B. Provide certificate of compliance acceptable to authorities having jurisdiction indicating conformance to fire-resistance requirements.

1.03 DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage: Deliver materials to job in Manufacturer's original unopened packaging. Adequately protect against damage while stored at the site. Deliver so that stocks of materials on the site will permit uninterrupted progress of the Work.

B. Materials shall be properly identified on each package with the Manufacturer's name and R value.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following Manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with Specification requirements:
   1. Board Insulation:
      a. The Dow Chemical Co. www.dow.com/styrofoam/na/
      b. Amoco Foam Products Co. www.bp.com/chemicals/who/units
      c. UCI
      d. Or equal
   2. Batt and Blanket Insulation:
      a. Johns-Manville www.jm.com
      b. Owens-Corning Fiberglas Corp. www.owenscorning.com
      c. Certainteed www.certainteed.com
      d. Or equal

B. Materials designated for a specific application shall be the products of one Manufacturer.

2.02 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide regional materials in accordance with Regional Materials provisions of Section 01 60 00.

B. Rigid Insulation (Walls): Expanded polystyrene: ASTM C578, Type I, 0.9 lb./cu. ft. (15 kg/m^3) nominal density.
1. R-Value per inch
a. at 40 degree F: 4.0
b. at 75 degrees F: 3.6
2. Thickness required for R-19: 5.27 inches

C. Batt Insulation (Fiberglass): ASTM C665, glass fiber batts. Batts shall be a single thickness to meet the required R value, multiple layers of batts will not be accepted.
1. Thickness: Provide minimum thickness as required to provide the resistance values as indicated in architectural construction assemblies and/or details.
2. Wall and Roof locations: Type I unfaced formaldehyde-free batt R-19 insulation at exterior walls and R-30 wire supported at roofs, unless otherwise noted on Drawings. Areas behind spandrel glass sections shall be insulated.

D. Fire Safing Insulation: ASTM C24, E119 and E136. Thickness shall be as required by the Manufacturer to provide a fire rating equal to that of the assembly of which it is a part. Where smoke stop protection also is required, install Thermafiber SmokeSeal Caulking Compound as needed to meet UL Standard 1479 and ASTM E814 procedure.

E. Acoustical Batt Insulation: As specified in Section 09 81 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Interior Board Insulation:
1. Install board insulation at locations as indicated on Drawings.
2. Insulate small areas between closely spaced framing members, pipe, conduit or other obstruction by cutting and fitting insulation materials as required to maintain the integrity of the insulation.
3. Fit ends snugly or overlap.
4. Under Refrigerators/Freezers: Install under slab and turn up at edge to match adjacent panels. Coordinate installation with equipment manufacturer.

B. Batt Insulation:
1. Apply no insulation until such time as the Construction has progressed to the point that inclement weather will not damage or wet the insulation material.
2. Fully insulate small areas between closely spaced framing members, pipes, conduits or other obstruction by cutting and fitting insulation material as required to maintain the integrity of the insulation.
3. Batt insulation at metal studs and other non-nailable members shall be installed with vapor barriers in and flanges continuously tight against framing members. Secure in place with string wire or other method as approved by Architect and Resident Engineer.
4. Place insulation tight to exterior wall or roof substrate without voids.
5. End match neatly with ends fitting snugly.

C Fire Safing Insulation: Install in proper sizes on safing clips as needed but not to exceed 24 inches O.C. Leave no voids between walls and edges of slabs.

3.03 CLEANING

A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

B. Protection: Take precautions to protect insulation, both during and after installation, from damage of any kind until covered.

C. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 07 26 53

VAPOR REDUCTION FLOOR COATINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Furnishing, testing, and application of floor coatings for the reduction of water vapor transmission for interior concrete slabs requiring the installation of ceramic tile, VCT, vinyl, wood, carpet, and/or epoxy flooring.

B. Related Sections - Coordinate work of this Section with work of other Sections to properly execute the work requirements and maintain satisfactory progress of work of other Sections.
1. Section 03 30 00 - Cast-In Place Concrete: Installation and curing requirements.
2. Section 09 30 00 - Tile: Installation requirements for tile floors.
3. Section 09 65 19 - Resilient Flooring: Installation requirements for resilient flooring.

1.02 SYSTEM DESCRIPTION

A. Provide one, or both, of the following systems as required to reduce the moisture vapor emissions from concrete floor slabs to that amount acceptable to meet finish floor manufacturer requirements. The initial calcium chloride tests performed for interior concrete slab areas receiving ceramic tile, VCT, vinyl, wood, carpet, and/or epoxy flooring systems will determine the location where each system shall be required.
1. Koester VAP 1 System (or equal):
   a. System shall be comprised of the full VAP 1 System which is 2 coats of VAP Primer followed by one coat of VAP Top Coat and a final coat of VAP Primer.
   b. This system is required on concrete floors with a water vapor transmission level greater than 8 lbs./24 hrs per 1,000 sf.
2. Koester VAP Primer System (or equal):
   a. System shall consist of 3 coats of VAP Primer only.
   b. This system is required on concrete floors with a water vapor transmission level less than 8 lbs./24 hrs per 1,000 sf.

B. Areas Not Requiring Vapor Reduction Floor Coating
1. Vapor Reduction Floor Coating is not required on interior concrete slabs without floor finish materials.
2. The initial calcium chloride tests for interior concrete slab areas receiving ceramic tile, VCT, vinyl, wood, carpet, and/or epoxy flooring will determine where this system will not be required. Vapor Reduction Floor Coating is not required on concrete floors with water vapor transmission level less than 3 lbs./24 hrs per 1,000 sf. This is only acceptable if the ceramic tile, VCT, vinyl, wood, carpet, and/or epoxy flooring Manufacturer and Owner approve.

1.03 SUBMITTALS

A. Product Data: For each type of product and process specified, which shall include:
1. Manufacturer's Specification.
2. Installation Instructions.

B. Experience with similar projects with a minimum of 2 years performance history. Similar projects shall be installations with initial vapor transmission rates of 15 lbs./ per 1,000 sf./ per 24 hrs. minimum having maintained vapor reduction rates of 3 lbs./ per 1,000 sf. / per 24 hrs. or less.

C. Submit calcium chloride test results (prior to and after installation of vapor reduction floor coating) to the Architect and Resident Engineer, Owner, Contractor, and Vapor Reduction Floor Coating Manufacturer's Representative.

1.04 QUALITY ASSURANCE

A. Qualifications of applicator
   1. Employ an applicator currently certified by the manufacturer, experienced in surface preparation and application of the material and subject to inspection and control of the manufacturer.
   2. Applicator should have no less than 2 years experience in the use of epoxy resin base coating application.

B. Manufacturer's Qualification
   1. Manufacturer shall have no less than 2 years experience in the manufacturing of epoxy based water Vapor Reduction Floor Coating.
   2. Manufacturer must provide independent lab test reports documenting performance per the following:
      a. ASTM E96, Water Vapor Transmission (dry and wet methods).
      b. ASTM D4541 Adhesion Properties (after ASTM E96).
      c. ASTM C309, Liquid Membrane-Forming Compounds for Curing Concrete.
      d. ASTM C156, Water Retention by Concrete Curing Materials.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the job site in their original unopened containers, clearly labeled with the manufacturer's name and brand designation.

B. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sun light. Product should not be stored in areas with temperatures in excess of 90 F or below 50 degrees F.

C. Handle product in a manner that will prevent breakage of containers and damage products.

1.06 PROJECT/SITE CONDITIONS

A. Environmental Conditions
   1. Do not apply Vapor Reduction Floor Coating to unprotected surfaces in wet weather or to surfaces on which ice, frost, or water is visible.
   2. Do not apply the Vapor Reduction Floor Coatings when the ambient/surface temperatures are below 50 degrees F (or expected to fall below this temperature within 24 hours from time of application) or above 90 degrees F
   3. Do not apply Vapor Reduction Floor Coating in rain, fog, snow, or mist.
   4. Never apply Vapor Reduction Floor Coatings to surfaces exposed to the sun.

B. Protection: Protect Vapor Reduction Floor Coating to prevent damage from active rain or topical water for a minimum period of 24 hours from time of application.

1.07 SCHEDULING

A. Two weeks before the installation of the ceramic tile, VCT, vinyl, wood, carpet, and/or epoxy flooring systems over the interior concrete slabs, provide initial calcium chloride tests as specified herein to determine the level of water vapor transmission in the slab and the type of Vapor Reduction Floor Coating required.

B. Contractor shall coordinate scheduling Vapor Reduction Floor Coating installation and allowing enough time to test, submit and apply the Vapor Reduction Floor Coating before installation of floor finish.

C. Contractor shall allow for as much time as is reasonable for the concrete slab to dry before testing the Vapor Reduction Floor Coating performance.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Koester American Corporation, 1206 Laskin Road, Sute 201 E, Virginia Beach, VA 23451 (757) 425-1206 locally distributed by Specified Polymers (Michael Hyduk), San Diego, CA (619) 294-8010, www.koester.com or approved equal.

2.02 MATERIALS

A. General:
1. Use specified materials of one manufacturer throughout project.
2. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
3. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.
4. Provide materials in accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

B. VAP Primer and VAP Top Coat: Water-based primer/curing agents containing epoxy resins and other specifically formulated chemicals to provide the following characteristics and properties.
1. Adhesion: Minimum 375 psi in accordance with ASTM D4541.
2. Water Vapor Transmission Reduction: Performance documented at no less that 90% water vapor transmission reduction compared to the untreated concrete slab by independent testing company when tested in accordance to ASTM E96 wet method.
3. VOC Content: No more than 0.1 lbs./gallon, mixed.
4. Conform to ASTM C309, Liquid Membrane-Forming Compounds for Curing Concrete and ASTM C156, Water Retention by Concrete Curing Materials.

C. Cementitious underlayment system (if required to level the floor over the VAP Systems): As required by vapor reduction floor coating manufacturer.
1. Tested and approved by VAP system manufacturer prior to installation.
2. No underlayment system with gypsum will be allowed.

2.03 MIXING

A. Use clean containers, mix thoroughly as per Manufacturer's requirements to obtain a homogeneous mixture using a low speed motor (below 400 rpm) and a Jiffy two blade type mixer. DO NOT AERATE.

B. VAP Primer Mix Ratio: Mix Component A and B at a ratio of 3:2.

C. VAP 1 Top Coat Mix Ratio: Mix Component A and B at a ratio of 4:1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect surfaces with regard to their suitability to receive Vapor Reduction Floor Coating with the Manufacturer's Representative.

B. Verify that surfaces to be treated with Vapor Reduction Floor Coatings have NOT previously been treated with other materials like underlayments, screeds, penetrating sealants, etc. If this is the case, consult with the Vapor Reduction Floor Coating Manufacturers Representative prior to any application of Vapor Reduction Floor Coatings.

C. Calcium chloride test requirements:
1. Two weeks before installation of the ceramic tile, VCT, vinyl, wood, carpet, and/or epoxy flooring systems over the interior concrete slabs provide calcium chloride test to determine the level of water vapor transmission in the slab.
2. Conduct testing in accordance with ASTM F1869 or ASTM E1907 (quantitative anhydrous calcium chloride test).
3. Conduct calcium chloride tests after HVAC system has been in continuous use for 36 hours with a minimum ambient temperature of 72 degrees F. Water vapor transmission levels are directly affected by ambient room temperature and readings conducted without a sustained ambient temperature is NOT acceptable.
4. Document test results and provide recommendations on the type of Vapor Reduction Floor Coating to be used by area.
5. Provide test results with a marked up floor finish plan showing test results.
6. Provide a written clarification on status of HVAC system before and during the test and the length of time the ambient air temperature was maintained before the tests.
7. Provide a marked up floor plan showing areas with Vapor Reduction Floor Coating recommendations.

3.02 PREPARATION

A. Clean surfaces to receive Vapor Reduction Floor Coatings.
1. Shotblast floors to receive system.
2. Remove defective materials, and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, grease, curing agents, form release agents, efflorescence, laitance, Shotblast beebees, etc.
3. Repair cracks, expansion joint, control joints, and open surface honeycombs and fill in accordance with Manufacturers recommendations.
4. Acid etching or grinding is not acceptable for surface preparation.
5. Provide uncontaminated surface.

B. Dampen, Surface Saturated Dry (SSD), uncontaminated concrete, leaving NO standing water. Surfaces shall be damp, not wet to the touch. Use clean potable water to pre-dampen concrete surfaces. Only pre-dampen concrete prior to first VAP Primer coat. Do NOT pre-dampen between subsequent coats of VAP Systems.

3.03 APPLICATION

A. VAP Primer coat application:
1. Spray VAP Primer leaving no areas untreated.
2. Avoid puddling and pinholes when back brushing.
3. Provide continuous ventilation during cure.
4. Apply VAP Primer coats at a coverage rate of 300 sf. per gallon per coat.

B. VAP Top Coat application:
1. Apply VAP Top Coat using a squeegee and 3/8” nap roller leaving NO areas untreated.
2. Avoid pin holes. To minimize air bubbles, use a spiked roller immediately after application of Top Coat.
3. Provide continuous ventilation during cure.
4. Apply VAP Top Coat at a coverage rate of 80 to 100 sf. per gallon unless otherwise directed by Manufacturer.
5. Top coat shall be homogenous and no less than 15 dry mils in thickness, particularly over high points on floors.

C. The VAP Primer System shall require a minimum of 6 hours drying time for the first Primer coat (based upon project conditions), a minimum of 6 hours of drying time for the second Primer coat (based upon project conditions), and 24 hours of drying time for the final Primer coat before the floor covering system can be installed.

D. The VAP 1 System shall require 6 hours drying time for the first Primer coat, 24 hours of drying time for the second Primer coat, 1 2 hours of drying time for the Top Coat, 24 hours of drying time for the final Primer coat before the floor covering system can be installed.

3.04 FIELD QUALITY CONTROL

A. Floor treatment calcium chloride tests:
1. After drying of the final coat of the Vapor Reduction Floor Coating, provide calcium chloride tests to determine if the level of water vapor transmission has been reduced below 3 lbs./ per 1,000 sf./ per 24 hrs.
2. Contact Architect and Resident Engineer, Owner, and Vapor Reduction Floor Coating Manufacturer’s Representative concerning any areas with a water vapor transmission level greater than 3 lbs./24 hrs. per 1,000 sf.

B. Adhesion tests:
1. Test adhesion of flooring adhesives, coatings, and leveling compounds to the final VAP Primer Coat.
2. Contact flooring Manufacturer for recommendations.

3.05 CLEANING

A. Clean tools and equipment with water for VAP Primer System and xylene for VAP Top Coat System immediately after use.

B. Remove debris resulting from VAP Systems installation from project site.

C. Construction Waste: In accordance with Section 01 74 19.

3.06 PROTECTION

A. Protect each coat during specified cure period from any kind of traffic, topical water, and contaminants.

END OF SECTION

SECTION 07 42 43.13

SOLID COMPOSITE EXTERIOR WALL PANEL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Exterior solid phenolic cladding panel system and accessories as required for a complete drained and back-ventilated rainscreen system.
   1. Exterior façade wall panels with exposed fasteners with aluminum bracketing system as provided by panel manufacturer over Water-Resistive Vapor Permeable Air Barrier Sheet over fiberglass faced gypsum sheathing panels..
   2. Fascia.
   3. Horizontal soffits.
   4 Storefront panels.

B. Related Sections:
   1. Section 04 21 33 – Thin Brick Veneer: Brick veneer over fiberglass faced gypsum sheathing panels.
   2. Section 05 41 00 - Load-Bearing Metal Stud System: Metal Framing at exterior wall construction and steel strapping on studs.
   3. Section 09 24 00 – Portland Cement Plaster (Stucco): Stucco over fiberglass faced gypsum sheathing panels.

1.02 SYSTEM DESCRIPTION - WATER-RESISTIVE VAPOR PERMEABLE AIR BARRIER SHEET

A. Supply labor, materials and equipment for a mechanically attached water-resistive vapor permeable air barrier membrane system, suitable for open joint cladding where designs allow for permanent UV exposure.

B. Complete Work as shown on the Drawings and specified herein to bridge gaps and seal the water-resistive vapor permeable air barrier membrane against air leakage and water intrusion.
   1. Connections of the walls to the roof membrane
   2. Connections of the walls to the foundations
   3. Seismic and expansion joints
   4. Openings and penetrations of window and door frames, store front, curtain wall
   5. Piping, conduit, duct and similar penetrations
   6. Masonry ties, screws, bolts and similar penetrations
   7. All other air leakage pathways in the building envelope

C. Install primary water-resistive vapor permeable air barrier, flashings, lap integrated seam tapes, sealants, and all related accessories as required by the manufacturer to achieve a continuous air barrier assembly.

1.03 SUBMITTALS

A. 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.

B. Shop Drawings: Submit plan, section, elevation and perspective drawings necessary to describe and convey the layout, profiles and product components, including edge conditions, panel joints, fixture location, anchorage, accessories, finish colors, patterns and textures.

C. Code Compliance (Exterior Panels): Documents showing product compliance with local building code shall be submitted. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product. Alternate materials must be approved by the Architect and Resident Engineer.

D. Engineering Calculations (Exterior Panels): Submit engineering calculations as required by the local building code, showing that the installed panels and attachments system meets the wind load requirements for the project.

E. Certifications (Water-Resistive Vapor Permeable Air Barrier Sheet)
1. Submit documentation from an approved independent testing laboratory certifying compliance with, a) the resistance to Hydrostatic Pressure, b) ASTM D 828 - Tensile Properties, c) ASTM E 84 – Class A Surface Burning Characteristics, d) ASTM E 96/E 96M - Test Methods for Water Vapor Transmission of Materials, and e) ASTM E 2178 - Standard Test Method For Air Permeance of Building Materials.
2. Submit documentation from an approved independent testing laboratory certifying the membrane meets ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers.

E. Samples:
1. Exterior Panels: For each finish product specified, two samples a minimum of 3.5 inches by 3.5 inches (89 mm by 89 mm) representing actual product, color, and patterns. Sample edges may vary from field panel edges.
2. Water-Resistive Vapor Permeable Air Barrier Sheet and Accessories:
   a. Manufacturer's sample standard warranty
   b. Water-resistive vapor permeable air barrier sheet, minimum 8 by 10 inches (203 by 254 mm)
   c. Components, minimum 12-inch (305-mm) lengths
   d Membrane flashings and lap seam tapes
   e. Fasteners, clips, strapping and masonry ties
   f. Sealants

F. Operation and Maintenance Data: Submit operation, maintenance, and cleaning information for products covered under this section.

G. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.04 QUALITY ASSURANCE

A. Exterior Panels:
   1. Manufacturer Qualifications: All primary panel products specified in this section will be supplied by a single manufacturer with substantial experience.
      a. Products covered under the Work listed in this section are to be manufactured in an ISO 9001 certified facility.
   2. Installer Qualifications: All products listed in this section are to be installed by a single installer trained and approved by the manufacture or representative.
   3. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

B. Water-Resistive Vapor Permeable Air Barrier Sheet and Accessories:
   1. Single Source: Water-resistive vapor permeable air barrier membrane components and accessories must be obtained as a single-source membrane system to ensure total system compatibility and integrity.
   2. Manufacturer Qualifications
      a. Manufacturer of specified products listed in this Section to have substantial continued experience in the manufacture and supply of highly vapor permeable water resistive air barrier products successfully installed in similar project applications.
      b. Manufacturer of specified products listed in this Section to have experienced in-house technical and field observation personal qualified to provide expert technical support.
   C. Fire Performance Characteristics: Provide water-resistive, vapor permeable air barrier meeting the following fire-test characteristics.

C. Mock-Up: If required by Resident Engineer, provide a mock-up for evaluation of the product and application workmanship.
   1. Mockup shall include all components of the wall assembly including metal studs, gypsum sheathing, Water-Resistive Vapor Permeable Air Barrier Sheet, aluminum bracketing system and solid phenolic classing system and accessories.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect and Resident Engineer.

D. Pre-installation Meetings: Conduct pre-installation conference to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's standard warranty requirements.

1.05 DELIVERY, STORAGE AND HANDLING

A. Exterior Panels:
   1. Delivery:
      a. During transportation, use stable, flat pallets that are at least the same dimension as the sheets.
      b. Materials shall be packaged to minimize or eliminate the possibility of damage during shipping. Items such as wooden side boards, wooden lid, and spacers or protective sheeting between panels shall be used to protect the panels from surface and/or edge damage.

2. Storage:
   a. Store products in an enclosed area protected from direct sunlight, moisture and heat. Maintain a consistent temperature and humidity.
   b. Store products in manufacturer's unopened packaging until ready for installation.
   c. Stack panels using protective dividers to avoid damage to decorative surface.
   d. For horizontal storage, store sheets on pallets of equal or greater size as the sheets with a protective layer between the pallet and sheet and on top of the uppermost sheet.
   e. Do not store sheets, or fabricated panels vertically.
3. Handling:
   a. Remove protective film within 24 hours of the panels being removed from the pallet.
   b. When moving sheets, lift evenly to avoid dragging panels across each other and scratching the decorative surface.
   c. Remove all labels and stickers immediately after installation.

B. Water-Resistive Vapor Permeable Air Barrier Sheet and Accessories:
1. Refer to current Product MSDS and/or Product Data Sheets for proper storage and handling.
2. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.
3. Store roll materials flat or on end in original packaging. Protect rolls from direct sunlight and inclement weather until ready for use.

C. Gypsum Sheathing:
1. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
2. Storage: Store panels flat in an enclosed shelter providing protection from damage and exposure to the elements.

1.06 PROJECT/SITE CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Field Measurements: Verify actual measurements/openings by field measurements performed by the installer prior to release for fabrication. Recorded measurements to be indicated on shop drawings based on field measurements provided by the installer. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.07 WARRANTY

A. Exterior Panels: At project closeout, provide manufacturer's standard 10 year warranty covering defects in materials. Warranty only available when material installed by an installation contractor trained and approved by the manufacturer's representative.

B. Water-Resistive Vapor Permeable Air Barrier Sheet and Accessories:
1. Provide manufacturer’s standard material warranty in which manufacturer agrees to provide replacement material for water-resistive vapor permeable air barrier sheets installed in accordance with manufacturer's instructions that fails due to material defects within 20 years of the date of Purchase.
2. Warranty shall include removal and reinstallation of exterior panels.

C. Gypsum Sheathing:
1. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay).
2. Manufacturer's Standard Warranty: Five (5) years against manufacturing defects.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Exterior Panels: Specifications are based upon Meteon FR Panels with exposed fastener system using 1" tall extruded aluminum hat channel provided by Trespa North America, Ltd, 800-487-3772 or equal.
1. Represented locally by W.H. Steele Co., 909-930-0831. A list of approved fabricators that provide the system specified in this section as judged and approved by the Architect and Resident Engineer may be acquired from the above.

B. Water-Resistive Vapor Permeable Air Barrier Sheet: Water-resistive vapor permeable air barrier membrane by VaproShield LLC., Gig Harbor, WA, Ph (866) 731-7663, Email: info@VaproShield.com, Website: www.vaproshield.com or equal.

C. Gypsum Sheathing: Georgia-Pacific Gypsum LLC or equal.

2.02 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Exterior Panels (Basis of design):
1. Solid panel manufactured using a combination of high pressure and temperature to create a flat panel created from thermosetting resins, homogenously reinforced with wood-based fibers and an integrated decorative surface or printed decor.
2. Panel Thickness: To be determined by grid design.
3. Color: "Rusty Red".
   a. Single Sided, black on back.
4. Finish: Satin.
5. Panel Core: Fire retardant (FR) black core.
6. Physical Properties:
   a. Modulus of Elasticity: 1,300,000 psi (9000 N/mm2) minimum, ISO 178.
   b. Tensile Strength: 10,100 psi (70 N/ N/mm2) minimum, ISO 527-2.
   c. Flexural Strength: 14,500psi (120 N/ N/mm2) minimum, ISO 178.
   d. Thermal Conductivity: 2.1 BTU/inch/ft2.hr.^{o}F, EN 12524.
   e. Structural Performance (ASTM E330):
      1) Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 15 pounds per square foot (psf). Wind load testing shall be done in accordance with this standard to obtain the following results:
      2) Normal to the plane of the wall, the maximum panel deflection shall not exceed L/175

3) Normal to the plane of the wall between supports, deflection of the aluminum sub-framing members shall not exceed L/175 or 3/4 inch, whichever is less

4) At 1-1/2 times design pressure, permanent deflection of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion.

5) If system tests are not available, mock ups shall be constructed and tests performed under the direction of an independent third party laboratory which show compliance to the minimum standards listed above.

7. Fire Performance:
   a. Flame Spread: Class A, ASTM E 84.
   b. Smoke Development: Less than 450, ASTM E 84.
   c. Ignition Temperature: Greater than 650 degree F (350 degree C) above ambient, ASTM D1929.
   d. Burning Classification: CC1 or CC2, ASTM D635.
   e. When required for compliance with local building codes, the wall cladding assembly shall show no degradation of the rating of Fire Resistant Assemblies, ASTM E119.
   f. When required for compliance with local building codes, the wall cladding assembly shall meet the performance requirements for Multi Story construction, NFPA 285.
   g. When required for compliance with local building codes, the wall cladding assembly shall not ignite when exposed to a radiant heat energy source, NFPA 268.
8. Finish Performance: Electron Beam Cure resin in conformance with the following general requirements:
   a. Color: As selected by the Architect and Resident Engineer from manufacturer's standard colors or a custom color to be matched by the panel supplier.
   b. Humidity Resistance: No formation of blisters when subjected to condensing water fog at 100% relative humidity and 100 degree F (38 degree C) for 3000 hours, ASTM D 2247.
   c. Salt Spray Resistance: Corrosion creepage from scribe line (1/16 inch (1.6 mm) max.) and minimum blister rating of 8 within the test specimen field, ASTM B117.
   d. Weather Exposure: Accelerated - 3000 hours in Atlas Type Weatherometer using cycle of 90 minutes light and 30 minutes diminished light and demineralized water with a maximum color change of 5 Delta E units from the original color according to ASTM D-2244, with the exception of Uni-Colors A12.3.7 / A18.3.5 / A04.1.7, which will not deviate more than 10 Delta E units from original color according ASTM D-2244.
   e. Color Stability: The decorative surface comply with, classification, 4 - 5 measured with the grey scale according to ISO 105 A02-93 according to test method EN 438-2:29.
   f. Microbial Characteristics: Will not support micro-organic growth (ISO 846).

9. LEED Requirements: Material provided under this section shall qualify for the following credits:
   a. MRc4 - Recycled Content: Panel materials shall consist of 15% post-industrial waste.
   b. MRc 5 - Local/Regional Materials: Materials shall be manufactured within a 500 mile radius of the project site.
   c. MRc6 - Rapidly Renewable Resources: : Panel materials shall be 70% rapidly renewable.
   d. IEAc 4.4: Panel shall not contain urea-formaldehyde.

B. Mounting System to be TS110 - Exposed fastening on fixed depth aluminum sub-framing.

C. Façade Panel Framing: Aluminum sub-structure shall be designed to withstand structural loading due to wind load and the dead load of the panel, and shall be painted as required to conceal behind the open joinery of the attachment system.
   1. Extrusions, formed members, sheet, and plate shall conform with the recommendations of the manufacturer.

D. Extruded Aluminum Trim: Color as specified in the finish schedule.

E. Fasteners: Fasteners shall be non-corrosive and as recommended by panel manufacturer. Exposed fasteners shall be colored to match panels where required by the Architect and Resident Engineer.

F. Water-Resistive Vapor Permeable Air Barrier Sheet and Accessories:
   1. Primary water-resistive air barrier sheet membrane shall be RevealShield® Water-Resistive Vapor Permeable Air Barrier Sheet by VaproShield or equal, a zero VOC mechanically attached water-resistive, vapor permeable air barrier sheet membrane consisting of multiple layers of UV stabilized material with integrated tape at horizontal seams, having the following properties:
      a. Color: Black with allowable UV exposure for 120 days total before being covered by cladding
      b. Air Leakage: < 0.00004 cfm/sq.ft. (0.0002 L/s/sq.m) when tested in accordance with ASTM E 2178 and < 0.000034 cfm/sq.ft. (0.00017 L/s/sq.m) when tested in accordance with ASTM E 283.
      c. Water Vapor Permeance tested to ASTM E 96 Method B: 42 perms (262.6 g/m^2)
      d. Water Resistance tested to AATCC 127, 550 mm hydrostatic head for 5 hours: No leakage
      e. Tensile Strength tested to ASTM D 828: 44.8 lbf/inch (68 N/mm), machine direction; 21.3 lbf/inch (37.3 N/mm), cross-machine direction
      f. Application Temperature: No temperature restrictions
      g. Surface Burning Characteristics tested to ASTM E 84: Class A, Flame-spread index of less than 10, Smoke-development index of less than 135
      h. Physical Dimensions: 0.020 inches (0.51 mm) thick and 59 inches (1.5 m) wide and 5 oz per sq. yd. (170 g/sq. m).
   2. Water-Resistive Air Barrier Sheet Membrane Fasteners
      a. Water-resistive air barrier sheet membrane fasteners shall be corrosion-resistant or stainless steel screws of #6, 7, or 8, bugle-head design.
      b. Screw head caps for water-resistive air barrier sheet membrane shall be VaproCaps by VaproShield or equal, a 1¾ inch diameter preformed head caps with a center throat hole that seals the membrane at the fastener penetration, specifically designed and tested to withstand wind loads and protect against water intrusion at screw penetrations.

c. Selection of fastener thread type is subject to sheathing board and substrate type. Manufacturer recommends subcontractor to supply and place corrosion-resistant or stainless steel screws sized to penetrate gypsum sheathing board through to solid backing or steel studs or wood sheathing by ¾ inch in conjunction with preformed screw head caps.

3. Water-Resistive Air Barrier Joint Sealant: Water-resistive air barrier sealant compatible with sheet membrane shall be Dow Corning® 758 or equal, a modified silicon-based Sealant tested for compatibility with VaproShield products.
4. Water-Resistive Air Barrier Transition and Flashing Membranes: Mechanically attached air barrier transition and flashing membrane shall be RevealFlashing™ by VaproShield or equal, a Black, highly UV stable, zero VOC mechanically attached water-resistive vapor permeable membrane having the following properties:
   a. RevealFlashing™: 6 1/2 inches, 11 3/4 inches or 19 2/3 inches wide x 164 feet long
   b. Air Leakage: < 0.0000263 cfm/sq. ft. @ 75 Pa (0.000134 L/s/m sq @ 75 Pa) when tested in accordance with ASTM E 2178
   c. Water Vapor Permeance tested to ASTM E 96 Method B: 42 perms (2875ng/Pa.s.m^2)
   d. Water Resistance tested to AATCC 127, 550 mm hydrostatic head for 5 hours: No leakage
5. Water-Resistive Flashing and Penetration Tapes: VaproTape™ by VaproShield or equal: UV stable, single sided, moisture-resistant flexible tape with adhesive backing having the following properties:
   a. VaproTape UV-Resistant Black: 35 mil thick by 4 inches (102 mm) wide penetration seam tape
   b. VaproAlumaTape: 20 mil thick by 4.5 inches (114 mm) and 9 inches (229 mm) wide, foil faced, UV stable, moisture-resistant flashing and membrane transition tape for use with silicone sealants
6. Vaproliqui-Flash™ Vapor Permeable Water Resistive Flashing or equal for Rough Openings: Window and door flashing shall be VaproLiqui-Flash by VaproShield, a liquid-applied vapor permeable air barrier flashing material with vapor permeance and resistance to air leakage properties compatible with the primary air barrier membrane.
7. Sill Pan Protection System: Extruded PVC sections with integral sloped shape, preformed corner dams and window unit spacer supports configured to drain moisture from window unit base to exterior shall be VaproSillSaver™ by VaproShield or equal. Coordinate selection of sill pan depth with window unit frame size. VaproSillSaver is designed for use with nail flanged equipped windows only.
8. Water-Resistive Weather Barrier Batten and Ventilation Accessories: As manufactured by VaproShield made of black PVC material
   a. VaproBatten™ or equal: Black vinyl extrusion with pre-formed fastener and moisture drainage channels configured to create a ventilated airspace between wall cladding and weather-resistive barrier. VaproVent™ L Strip and VaproVent™ Hook Strip not necessary in typical open joint cladding systems.
9. Penetration Sealant: Provide sealant for penetrations as recommended by manufacturer and as specified under Division 07 Section: Sealants. Appropriate sealants shall be Dow 758 or VaproLiqui-Flash or equal.

G. Gypsum Sheathing: Fire-Rated Fiberglass-Mat Faced Gypsum Sheathing conforming to ASTM C1177, Type X:
   1. Thickness: 5/8 inch.
   2. Width: 4 feet.
   3. Length: 8 feet, 9 feet or 10 feet as applicable to project requirements.

4. Weight: 2.5 lb/sq. ft.
5. Edges: Square.
6. Surfacing: Fiberglass mat on face, back, and long edges.
7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 654 pounds per square foot, dry.
8. Flexural Strength, Parallel (ASTM C1177): 100 lbf, parallel.
9. Humidified Deflection (ASTM C1177): Not more than 1/8 inch.
10. Permeance (ASTM E96): Not more than 17 perms.
11. R-Value (ASTM C518): 0.67.
12. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
13. Microbial Resistance (ASTM D6329, GREENGUARD 3-week protocol): Will not support microbial growth.
14. Acceptable Product: 5/8 inch DensGlass Fireguard Sheathing, Georgia-Pacific Gypsum or equal
15. Fasteners: ASTM C1002, corrosion resistant treated screws.

2.03 FABRICATION

A. Panels: Solid phenolic impregnated Kraft paper wall panels with no voids, air spaces or foamed insulation in the core material. Accessory items in accordance with manufacturer's recommendations and approved submittals.

B. Panel Weight: 8 mm (2.4 lb/ft2), 10 mm (3 lb/ ft2), 13 mm (3.8 lb/ ft2).

C. Panel Bow: <= 2 mm / m (<= 0.079 inch/39.38 inches).

D. Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.

E. Appearance: Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.

F. All panel-exposed edges shall be square cut, with an eased edge.

2.04 SOURCE QUALITY CONTROL

A. Panels to be U.L. registered and labeled for quality consistency.

PART 3 EXECUTION

3.01 EXAMINATION

A. Preconstruction Conference: A conference shall be held at the jobsite prior to start of construction of this portion of the work to review substrates, flashing conditions, work provided by preceding trades and work required by trades following this work. General Contractor, subcontractor(s) affected by the work of this section, Architect and Resident Engineer shall be in attendance. If required, modifications shall be made to details and to specifications to address actual field conditions.

B. Gypsum Sheathing:
1. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.
2. Verify that surface of framing members do not vary more than 1/4 inch from the plane of faces of adjacent members.
3. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

C. Water-Resistive Vapor Permeable Air Barrier Sheet and Accessories:
1. Verify that surfaces and conditions are ready to accept the Work of this section. Notify Resident Engineer in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.
2. All surfaces must be sound, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the water resistive air barrier flashings. Fill voids, gaps in substrate to provide an even surface. Strike masonry joints full-flush.
3. Minimum application temperature self-adhered membrane flashings to be above 20 degrees F (minus 6.0 degrees C).
4. Ensure all preparatory Work is complete prior to applying primary water-resistive weather barrier membrane.
5. Mechanical fasteners used to secure sheathing boards or penetrate sheathing boards shall be set flush with sheathing and fastened into solid backing.

D. Exterior Panels:
1. Do not begin installation until substrates have been properly prepared.
2. Surfaces to receive panels shall be even, smooth, dry, and free from defects detrimental to the installation of the panel system. Notify Contractor in writing of conditions detrimental to proper and timely completion of the work.
3. Confirm exterior sheathing is plumb and level, with no deflection greater than 1/4 inch (6 mm) in 20 feet (6096 mm).
4. Weather resistant barrier shall be accepted by panel manufacturer prior to beginning of installation of panel system.

E. Coordination with other Work: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Gypsum Sheathing: In accordance with GA-253, ASTM C1280 and the manufacturer's recommendations and IBC requirements.
1. Verify that surface of framing members do not vary from more than 1/4 inch from the plane of faces of adjacent members.
2. Panels of the maximum length possible shall be used to minimize the number of joints. Edge joints must be located parallel to and with vertical orientations on framing. End joints of adjacent lengths of sheathing must be staggered.
3. Cut board at penetrations, edges and other obstructions; and fit tightly against abutting construction, unless otherwise indicated.
4. Fasteners must be driven so as to bear tight against and flush with surface of sheathing, but do not cut into facing.. Fasteners must not be countersunk.
5. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
6. Fasteners must be located a minimum of 3/8 inch from edges and ends of sheathing panels.

B. Water-Resistive Vapor Permeable Air Barrier Sheet and Accessories:
   1. Install in accordance with manufacturer's printed instructions.
   2. Membraneshall be installed as continuous membrane, sealed back to the substrate or exterior sheathing around the perimeter edges of the walls and all lap seams.
   3. Install accessories as required by manufacturer's installation instructions.
   4. Sealant at seams shall be Dow 758.

C. Exterior Panels
   1. Install solid phenolic wall panels and sub-frame system in accordance with manufacturer's instructions.
   2. Install solid phenolic wall panels plumb and level and accurately spaced in accordance with manufacturer's recommendations and approved submittals and drawings.
   3. Anchor panels and sub-framing securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary movement and structural support.
   4. Fasten solid phenolic wall panels with fasteners approved for use with supporting substrate.
   5. Do not install panels or component parts which are observed to be defective or damaged including, but not limited to: warped, bowed, abraded, scratched, and broken members.
   6. Do not cut or trim component parts during installation in a manner that would damage the finish, decrease the strength, or result in visual imperfection or a failure in performance. Return component parts with require alteration to the shop for re-fabrication or replacement.
   7. Install corner profiles and trim with fasteners appropriate for use with adjoining construction as indicated on the Contract Drawings and as recommended by manufacturer.
   8. Installed panels shall have open joints of 3/8" - 1/2". Exact sizes and dimensions to be coordinated with the drawings, field conditions and approved shop drawings.
      a. The vertical joints are to appear open, but have the black sub frame assembly directly behind joints, in effect closing the joint.
      b. The horizontal joints are open.
   9. Outside corner profiles to be "open joint".
   10. Every vertical section of the façade cladding shall have a ventilation opening at the bottom and top, having a width / depth of 2.36 square inch / foot (50 cm2/m.
   11. Opening between bottom of façade and the structural wall shall be covered by ventilation profile to prevent animals or other objects from being hidden behind the panels. The perforation grade needs to meet the openings per area in accordance to point F (2.36 square inch / foot).
   12. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
      a. Site Visits: At least twice per month during exterior system installation.

3.05 ADJUSTING AND CLEANING - EXTERIOR PANELS

A. Adjust final panel installation so that all joints are true and even throughout the installation. Panels out of plane shall be adjusted with the surrounding panels to minimize any imperfection.

B. Repair panels with minor damage. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the General Contractor.

C. Remove any masking or panel protection as soon as possible after installation. Any masking intentionally left in place after panel installation on an elevation, shall become the responsibility of the General Contractor.

D. Construction Waste: In accordance with Section 01 74 19.

3.06 PROTECTION

A. Water-Resistive Vapor Permeable Air Barrier Sheet:
   1. Protect wall areas covered with primary water-resistive vapor permeable air barrier from damage due to construction activities, high wind conditions, and extended exposure to inclement weather.
   2. Review condition of water-resistive weather barrier prior to installation of cladding. Repair, or remove and replace damaged sections with new membrane.
   3. Recommend to cap and protect exposed back-up walls against wet weather conditions during and after application of membrane, including wall openings and construction activity above completed primary water-resistive weather barrier installations.
   4. Remove and replace water-resistive vapor permeable air barrier affected by chemical spills or surfactants.

B. After installation, the General Contractor shall protect the wall panel system from damage. The panels shall be kept free from paint, plaster, cement scratches, or any other destructive forces.

END OF SECTION

SECTION 07 53 16

SINGLE PLY MEMBRANE ROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Fleece backed TPO adhered roofing system (with integral solar panels).
2. Add Alternate: Fully operational, photovoltaic, grid-tied, electric generating system.

1.02 REFERENCES

A. Roofing Terminology: Refer to the following publications for definitions of roofing work related terms in this Section:
1. ASTM D 1079 “Terminology Relating to Roofing and Waterproofing.”
2. Glossary of NRCA's "The NRCA Roofing and Waterproofing Manual."
3. Roof Consultants Institute “Glossary of Roofing Terms.”

B. Sheet Metal Terminology and Techniques: SMACNA Architectural Sheet Metal Manual.

1.03 SYSTEM DESCRIPTION

A. General: Comply with the requirements of the LEED™ "Sustainable Site" Credit No. 7.2. This credit requires the usage of roofing materials having a Solar Reflectance Index (SRI) equal to or greater than the 78 for a low-sloped roof (≤ 2:12) for a minimum of 75% of the roof surface.

B. Performance Requirements – Roofing Membrane
1. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
2. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
3. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "RoofNav " for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.
   a. Fire/Windstorm Classification: Class 1A- 90.
4. California Code of Regulations Title 24 (T24/CRRC-1):
   a. Roofing system shall comply with the requirements of Title 24.

C. Performance Requirements – Photovoltaics
1. Array Size (WATTS STC): 7800 W
2. Modules: 30 (260 W).
3. Inverter: 7500W

1.04 SUBMITTALS

A. Product Data: Submit Manufacturer's Specifications, installation instructions and evidence of UL and FM ratings for system for each type of product specified or required.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
1. Base flashings and membrane terminations.
2. Perimeter details.
3. Parapet tops
4. Crickets, saddles, and tapered edge strips, including slopes.
5. Provide shop drawings detailing the location of all building integrated PV mounts, electrical connections and penetrations.

C. Samples for Verification: If requested by Architect and Resident Engineer, submit samples of the following products:
1. 12-by-12-inch square of sheet roofing, of color specified, including T-shaped side and end lap seam.
2. 12-by-12-inch square of walkway pads or rolls.
3. 12-inch length of metal termination bars.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is currently approved, authorized, or licensed by manufacturer to install roofing system.

E. Manufacturer Certificates:
1. Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
2. Submit evidence of meeting performance requirements and intent to guarantee.

F. Qualification Data: For Installer and manufacturer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

H. Research/Evaluation Reports: For components of membrane roofing system.

I. Maintenance Data: For roofing system to include in maintenance manuals.

J. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

K. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

L. Roofing contractor shall submit a RoofNav Contractor Package or an Application for Acceptance of Roofing System (FM form EMV 2688) for Fire/Windstorm Class IA-90 (per 07 53 16) with detailed installation plans and materials submittals to FM Global for review and approval prior to installation.

1.05 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Roofing: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's standard warranty as required herein.
   2. PV Generating System: Installer must provide evidence of individual with NABCEP or CSRP accreditation who will be present and actively participating in the installation of the entire PV system.

B. Manufacturer Qualifications: A qualified manufacturer with a minimum of 2 years experience manufacturing membranes for projects similar in size and scope to this project.

C. Test Reports: Roof drain and leader test or submit plumber's verification.

D. Source Limitations:
   1. Obtain components for membrane roofing system from same manufacturer as roofing membrane or from manufacturer approved by roofing membrane manufacturer.
   2. Roofing manufacturer must also manufacture the PV mounting system and integrate the PV mounting system into the roofing No Dollar Limit guarantee.

E. Fire-Test-Response Characteristics:
   1. Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
   2. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.

F. Certificates: Submit certification from Manufacturer indicating approval of the applicator and submit certifications from both Manufacturer and Applicator that the substrate and the details are proper and adequate for materials being furnished.

G. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to roofing system including, but not limited to, the following:
   1. Meet with Owner; Architect and Resident Engineer; Owner's insurer if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.

8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

H. UL Listing: (for Roofing Components) Provide Class "A" labeled materials which have been tested and listed by UL for application indicated. Packaging and containers shall bear UL label.

I. Membrane Manufacturer's Representative shall inspect the installation of the roofing system. Inspection shall include a pre-solar and post-solar installation report.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver roofing materials in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

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

E. Replace damaged materials.

1.07 PROJECT/SITE CONDITIONS

A. Physical Requirements for Proper Installation or Application:
1. The adhered membrane shall not be installed under the following conditions without consulting manufacturer’s technical department for precautionary steps:
   a. The roof assembly permits interior air to pressurize the membrane underside.
   b. Any exterior wall has 10% or more of the surface area comprised of opening doors or windows.
   c. The wall/deck intersection permits air entry into the wall flashing area.
2. Precautions shall be taken when using adhesives at or near rooftop vents or air intakes. Adhesive odors could enter the building. Coordinate the operation of vents and air intakes in such a manner as to avoid the intake of adhesive odor while ventilating the building. Keep lids on unused cans at all times.
3. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

B. Weather Limitations: Proceed with installation only when current and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written instructions and guarantee requirements.

1.08 WARRANTY

A. Provide manufacturer's standard system guarantee equal to Johns Manville's Peak Advantage No Dollar Limit Roofing System Guarantee.
1. Single-Source special guarantee includes roofing membrane, flashings, roofing membrane accessories, roof insulation, fasteners, cover board, vapor retarder, walkway products, manufacturer's edge metal products, integral roof photovoltaic mounting and panel system and other single-source components of roofing system marketed by the manufacturer.
2. Guarantee Period: 25 years from date of Substantial Completion.

B. Installer's Guarantee: Submit roofing Installer's standard guarantee, including all components of roofing system for the following guarantee period:
1. Guarantee Period: Two Years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Fleece Backed Fabric-Reinforced Thermoplastic Polyolefin (TPO) Sheet: ASTM D 6878, uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced with fleece backing. Basis of Design: JM TPO or equal
1. Fleece backed Membrane Thickness: 135 mils, nominal.
2. Accelerated Weathering: Minimum of 24,000 hours without cracking or crazing as tested using ASTM G155.
3. Tensile Strength: Minimum of 300 lbf as tested using ASTM D751
4. Tearing Strength: Minimum of 85 lbs as tested using ASTM D751

C. Auxiliary Roofing Materials
1. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
a. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
2. Sheet Flashing: Manufacturer's sheet flashing of same material, type, reinforcement, thickness, and color as sheet membrane. Basis of Design: JM TPO or equal.
3. Sheet Flashing: Manufacturer's unreinforced sheet flashing of same material as sheet membrane. Basis of Design: JM TPO Detail Membrane or equal
4. Bonding Adhesive: Manufacturer's standard water-based bonding adhesive for membrane, and Low VOC solvent-based bonding adhesive for base flashings. Basis of Design: JM TPO Membrane Adhesive (Low VOC), JM TPO Membrane Adhesive (Water Based) or equal.
5. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.
6. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, with anchors. Basis of Design: JM Termination Systems or equal.

7. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer. Basis of Design: High Load Fasteners and Plates
8. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories. Basis of Design: JM TPO Pipe Boots, JM TPO Universal Corners, JM TPO Edge Sealant, JM TPO T-Joint Patch, JM TPO Membrane Cleaner, JM TPO Membrane Primer, JM TPO Sealing Mastic, JM TPO Detail Membrane, JM TPO-Coated Metal and JM Single Ply or equal

D. Auxiliary Roofing System Components
1. Coping System: Manufacturer's factory fabricated coping consisting of a base piece and a snap-on cap. Provide product manufactured and marketed by single-source membrane supplier that is included in the No Dollar Limit guarantee. Basis of Design: Presto-Lock Coping or equal
2. Fascia System: Manufacturer's factory fabricated fascia consisting of a base piece and a snap-on cover. Provide product manufactured and marketed by single-source membrane supplier that is included in the No Dollar Limit guarantee. Basis of Design: Presto Lock Fascia or equal
3. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

E. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads sourced from membrane roofing system manufacturer. Basis of Design: JM TPO Walkpad or equal

F. Tapered Insulation: ASTM C 1289, provide factory-tapered insulation boards for crickets fabricated to slope indicated on drawing. Basis of Design: Tapered ENRGY 3 or equal.

G. Cover Board (High-Density Polyisocyanurate): High-density polyisocyanurate technology bonded in-line to mineral-surfaced, fiber glass reinforced facers with greater than 125 lbs of compressive strength conforming to ASTM C1289, Type II, class 4, Grades 1, 2 and 3. This board to be installed over 5/8" Dens Glass gypsum wall board. Basis of Design: Invinsa Roof Board or equal.

H. Insulation Accessories
1. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
2. Urethane Adhesive: Manufacturer's two component urethane adhesive formulated to adhere insulation to substrate. Basis of Design: JM Two-Part Urethane Insulation Adhesive or equal.
3. Wood Nailer Strips: Comply with requirements in Division 06 Section **"**Miscellaneous Carpentry**."**

I. Photovoltaic system: Non-ballasted, non-penetrating, roof-integrated mounting system with monocrystalline PV panels and fully-integrated inverter.
1. Mounting system:
   a. Basis of Design: Johns Manville JM E3co ENRGY Curb or equal.
   b. Mounting system must not require ballast of any kind.
   c. Mounting system must not require roof penetrations of any kind.
   d. Provide total installed system weight of less than 3.5 pounds per square foot.
   e. Mounting system must have an installed height lower than 18 inches.
   f. Mounting system must not create areas of point loading.

g. Mounting system must be made of TPO compatible material capable of being heat welded to TPO membrane

2. Photovoltaic Panels (Basis of Design): Suniva OPT 260-60-4-100 panels or equal.
3. Inverter: (Basis of Design): Solectria PVI 7500 inverter including monitoring and all combiner / disconnect accessories or equal.
4. Provide conduits, wiring and other equipment and materials as required to provide a complete operating system.

J. Roof Drains: In accordance with plumbing drawings and specifications. Roof drain provided shall comply with roofing manufacturer's standard warranty requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements affecting performance of roofing system:
1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean and remove from substrate sharp projections, dust, debris, moisture, and other substances detrimental to roofing installation in accordance with roofing system manufacturer's written instructions.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Prime surface of concrete deck with 1 layer of TPO Waterbased adhesive at a rate recommended by roofing manufacturer and allow to dry.

D. Mechanically attach Invinsa Coverboard over installed 5/8" Dens Glass on all parapet walls using approved screws and plates.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.

B. Where roof slope exceeds 1/2 inch per 12 inches (1:24, contact the membrane manufacturer for installation instructions regarding installation direction and backnailing

C. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.

D. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.
1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

E. Roof Drains: Installation shall be In accordance with plumbing drawings and specifications. Roof drain provided shall comply with roofing manufacturer's standard warranty requirements.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.04 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane specification ST6PA over area to receive roofing in accordance with membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply water-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

D. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

E. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

F. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Remove and repair any unsatisfactory sections before proceeding with Work.
4. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.

G. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

H. Install roofing membrane and auxiliary materials to tie in to existing roofing.

I. Piping and Lightning Protection: Provide additional layer of membrane at roof pipe supports, lightning rods and lightning rod cables per manufacturer's standard details.

J. Proceed with installation only after unsatisfactory conditions have been corrected.

3.05 FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply Low VOC solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with sheet flashing.

D. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

E. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.

F. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.06 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere with compatible adhesive and heat weld walkway products to substrate according to roofing system manufacturer's written instructions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.07 PHOTOVOLTAIC INSTALLATION

A. Locate PV array as shown on Drawings and approved shop drawings.

B. Install membrane integrated PV mounting system on TPO roof using both hot air weld attachment and tape attachment:
1. Weld the factory applied TPO strip to the TPO roof using a robotic or hand hot air welder. Bring a scrap piece of TPO to test weld to roof before beginning installation of mounting system. Upon request, provide a minimum of 3 dated and initialed test welds per day.
2. Tape remaining 3 sides of curb flanges to the TPO using factor applied peel-and-stick tape. Firmly roll in tape to ensure intimate bond.

C. Follow PV Mounting manufacturer's and PV Solar Panel manufacturer's recommendations for location and tightening details.

D. Install photovoltaic system in accordance with NEC, manufacturer's printed instructions, electric utility service provider requirements, and approved shop drawings.

E. Install PV modules and DC to AC inverters with sufficient clearance to allow for proper ventilation and cooling.

F. Comply with manufacturer's clearance recommendations.

G. Preferred installation requires operational PV modules in location and manner to ensure maximum unobstructed, direct sun exposure.

H. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.

I. Allow for expansion and contraction due to thermal changes and structural movement without detriment to appearance or performance.

J. Installer shall verify that site, mounting surface substrate, supports and other site and work conditions are adequate and proper for installation.

3.08 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's Technical Representative to inspect roofing installation on completion and submit report to Architect and Resident Engineer.
1. Notify Architect and Resident Engineer or Owner 48 hours in advance of date and time of inspection.

C. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.09 ADJUSTING

A. Re-inspect roofing and repair bonding defects, raised or exposed fasteners, delaminated flashings, and other defects.

3.10 CLEANING

A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 50 00.

B. Construction Waste: In accordance with Section 01 74 19.

3.11 PROTECTION

A. Before the end of each working day, or before application is interrupted by precipitation, seal exposed sheet edges along laps and around drains, projections, and upstands.

B. Cutoffs shall be built in accordance with Manufacturer's printed instructions and constructed to withstand protracted periods of service. Cutoffs shall be completely removed prior to the resumption of roofing.

C. Protection of installed roof membranes: Protect building roof coverings against damage from roofing work or work on roof by all trades until completion of project. Where traffic or work must occur over roof coverings, protect entire surface areas with canvas sheets and minimum 1/2 inch thick rigid boards with ballast sufficient to secure protection in place during work and inclement weather.

END OF SECTION

SECTION 07 60 00

FLASHING AND SHEET METAL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Flashings, sheet metal work and related items including, but not limited to:
   1. Counterflashing at vertical surfaces.
   2. Flashing at roof penetrations.
   3. Edge flashing.
   4. Sheet metal scuppers, gutters and downspouts.
   5. Metal copings.
   6 Sump pans.

1.02 SUBMITTALS

A. Shop Drawings: Submit Drawings indicating type of material, gage, dimensions, profiles, locations where used, fastening and anchoring methods, joints, and provisions of expansion and contraction.

B. Samples: Submit samples of each type of prefinished metal in selected color(s).

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Standards:
   1. Comply with design and installation methods of SMACNA Architectural Sheet Metal Manual.
   2. Comply with The NRCA Roofing and Waterproofing Manual installation details.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Materials:
1. Prefinished Metal (Polyvinyl Fluoride):
a. Hot-dipped galvanized, ASTM A653 Structural Quality, Grade 40, G90 coating 20 gauge core steel, or prefinished Galvalume - ASTM A792.
b. Finish: Full strength Kynar 500/Hylar 5000 fluoropolymer coating, applied by the Manufacturer on a continuous coil coating line, with top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Color as selected by Architect and Resident Engineer from manufacturer's full range of colors.
2. Bonderized Galvanized Steel: ASTM A653, 20 gauge minimum and as indicated, with G-60 coating which has been put through a phosphate bath and chromate drying process leaving it ready to accept paint.
3. Reglets and Counterflashings: Fabricated from stainless steel. Fry Reglet Corporation, Type SM at masonry and Concrete, or fabricated as indicated on Drawings. Provide prefabricated inside and outside reglet and counterflashing corners.

C. Galvanized Steel: ASTM A653, 24 gauge minimum and as indicated with G-60 coating.

2.02 ACCESSORIES

A. General
1. Provide recycled materials (for accessories) in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials (for accessories) in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Reglets and Counterflashings: Fry Reglet Corporation, Type STX at stucco, Type SM at masonry and Concrete, or fabricated as indicated on Drawings. Provide prefabricated inside and outside reglet and counterflashing corners.

C. Solder: ASTM B32, 50/50 type.

D. Flux: FS O-F-506.

E. Sealant: As specified in Section 07 92 00.

F. Plastic Cement: ASTM D4586.

G. Bituminous Coating: FS TT-C-494 or SSPC paint - 12, dry film 15 mils per coat.

H. Sheet Metal Fasteners:
1. Galvanized steel: Pre-finished galvanized steel with soft neoprene washers at exposed fasteners.
2. Stainless steel: Stainless steel Type 300 series, selected to prevent galvanic action with the components fastened. Where exposed in finished surfaces, use oval-head countersunk cross-headed screws with head diameter one (1) screw size smaller than the shank diameter, finished to match adjacent surfaces.

I. Prefinished Metal Seam Sealers and Adhesives: As recommended by prefinished metal manufacturer for waterproof and weather-resistant seaming and adhesive applications of flashing and sheet metal work.

2.03 FABRICATION

A. Fabricate sheet metal with lines, arris, and angles sharp and true, and plane surfaces free from objectionable wave, warp or buckle. Hem exposed edges to form a 1/2 inch wide hem on the side concealed from view.

B. Fabricate scuppers, gutters and downspouts in accordance with SMACNA Architectural Sheet Metal Manual and as indicated on drawings.

C. Forming, anchoring, expansion and contraction details, shall conform to referenced quality standards.

D. Provide for thermal expansion of running trim, flashing, expansion joints, and other items exposed for more than 15 feet continuous length.

E. Fabricate cleats and starter strips of same material as sheet.

F. Form pieces in longest practical lengths, except form flashing and facias in 8 to 10 foot units.

G. Fabricate coping covers with butt seam with backup plate, fastened one side seams (item 19, figure 3-3 per SMACNA Architectural Sheet Metal Manual).

H. Solder and seal metal joints or use seam sealer/adhesive as recommended by prefinished metal manufacturer. After soldering, remove flux. Wipe and wash solder joints clean by scrubbing, neutralizing with ammonia or a 5 to 10 percent solution of washing soda, followed by a clear water rinse..

I. Fabricate corners from one piece with minimum 18 inch long legs, with mitered corners; solder for rigidity, seal with sealant.

J. Fabricate flashings to allow toe to extend 2 inches over roofing. Return and brake edges.

K. Where prefabricated counterflashing and reglet system is used, form upper edge of counterflashing with an approved snap lock flange to engage reglet receiver and to provide a spring action at bottom edge against built-up flashing.

L. Flashing Pans: Form sheet metal pans 6 inch nominal square size, with 3 inch upstand, and 4 inch flanges. Fill pans watertight with plastic cement.

2.04 FINISH

A. Shop prepare and prime exposed ferrous metal surfaces.

B. Backpaint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 1.5 mil.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.
1. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
2. Verify membrane termination and base flashings are in place, sealed, and secure.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Installation shall conform to NRCA and SMACNA manuals.

B. Expansion Seams: Maintain a watertight installation at expansion seams. Locate expansion seams as shown or if not shown, at the following maximum spacing for each general flashing use:
1. Flashing, expansion joints, gravel stops, and trim: At 10 foot intervals, 24 inches on each side of corners and intersections.
2. Sealant-type expansion joints: Where sealant-filled expansion joints are used, embed the hooked flanges of the joint members not less than 1 inch into the sealant. Form joints to completely conceal the sealant. When ambient temperature is moderate at the time of installation (40 to 70 degrees F.), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant type joints at temperatures below 40 degrees F. Installation of sealant is specified in Section 07 92 00.

C. Where dissimilar materials abut, provide proper separation or protection to minimize the possibility of galvanic action.

D. Soldering:
1. Except where other methods of joining are indicated or specified, solder joints and connections of Sheet Metal Work.
2. Remove grease and dirt from metal surfaces to be joined.
3. Remove flux residue by scrubbing, neutralizing with ammonia or a 5 to 10 percent solution of washing soda, followed by a clear water rinse.
4. Assemble parts and solder using regular non-corrosive resin flux. Heat metal thoroughly to completely sweat solder through full contact area.

E. Reglets: Install reglets in masonry or stucco to receive flashings.

F. Counterflashing:
1. Provide metal counterflashing at top edges of base flashings and at other locations indicated.
2. Lap end joints a minimum of 3 inches. Do not solder or weld joints. Make flashing continuous at angles. Counterflashing shall overlap base flashing a minimum of 4 inches, unless otherwise indicated.
3. Where counterflashing terminates in reglets, fasten flashing with lead wedges every 12 inches. Fill reglets continuously with synthetic rubber type sealant.

G. Copings:
1. Cover top of parapet walls where indicated with 24 gage galvanized metal coping formed to design shown. Before applying metal, cover top of wall or wood blocking with polyethylene.
2. Extend front edge of coping covering down over the lock into a previously placed continuous edge strip. Secure edge strips with nails spaced 12 inches apart.
3. Join rear edge of coping covering to adjacent flashings as indicated.

3.03 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 07 72 00

ROOF ACCESSORIES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Submit Manufacturer's Specifications, design data and installation instructions.

B. Shop Drawings: Submit Drawings showing layout, dimensions and construction details.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

1.03 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements; proper fit and attachment of parts is required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following Manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with Specifications requirements:
1. Bilco Co. www.bilco.com
2. Bristolite www.bristolite.com
3. Cierra Products www.cierraproducts.com
4. J.L. Industries www.jlindustries.com
5. Pate Co. www.patecurbs.com
6. Milcor, Inc. www.milcorinc.com
7. Nystrom Building Products www.nystrom.com
8. O'Keeffe's Inc. www.okeefes.com
9. Acralight International; Div. Of International Skylights (Roof Hatches) www.acralight.com
10. Or equal.

2.02 MANUFACTURED UNITS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Roof Hatch: Bilco Type S-20, or as approved. www.bilco.com or equal. Galvanized steel, 14 gage cover and curb, 22 gage cover liner. 1 inch thick rigid insulation in curb and cover, 12 inch high curb.
1. Provide heavy duty padlock hasp.
2. Provide vandal resistant features as available.
3. Finish: Red-oxide primer. Paint finish in accordance with Section 09 91 00.

C. Curbs: Pate Style pc-1b, or equal, box section design, heavy gage galvanized steel construction, continuous mitered and welded corner seams, integral base plate, factory installed wood nailer, and insulated with 1-1/2 inch thick rigid fiberglass board insulation.

D. Equipment Supports: Pate Style es-1 or equal, monolithic construction, heavy gage galvanized steel, continuous mitered and welded corner seams, integral base plate, factory installed 2 inch x 4 inch wood nailer, and heavy gage galvanized steel counterflashing.

E. Pipe Curb Assemblies: Pate Style pca-1 or equal, with curb constructed of heavy gage galvanized steel with continuous welded corner seams, factory installed wood nailer insulated with 1-1/2 inch thick rigid fiberglass board insulation, cover of acrylic clad ABS thermoplastic, including graduated step PVC, boots, adjustable stainless steel clamps and cap fastening screws. Each assembly shall include curb, cap, boots and clamps. See Drawings for size and quantity of pipe penetrations.

F. Ladder extension (for roof hatches): Bilco Model 1 LadderUP safety post, or Bristolite Grab Bar or equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Install roof specialties at locations shown or required in accordance with Manufacturer's instructions and as detailed on Drawings.

B. Install roof hatches, equipment supports and bases, curbs and curb assemblies, at locations indicated, fastening securely to deck through curb flange.

3.03 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19..

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Provide UL Classified or Warnock Hersey Listed firestopping system to prevent the spread of fire, smoke and gasses through penetrations in fire resistive walls, floors and partitions, including; but not limited to; the following areas:
   1. Unprotected openings and openings accommodating penetrating items such as cables, cable trays, pipes, ducts, boxes and conduits through fire rated floors, walls and smoke barriers.
   2. Head of wall openings between wall and connecting floor or roof deck assemblies.
      a. Meet requirements for exposure to hose stream test.
      b. Applicable for use with steel fluted deck floor assemblies.
      c. Allow deflection of floor or roof above.

B. Firestop systems shall not be intended to support live loads and traffic unless specifically approved by Testing Agency.

C. Firestop systems shall be approved by Code Authority.

D. Firestop products shall remain flexible where subject to movement without affecting the integrity of the product.

1.02 SUBMITTALS

A. Product Data: Submit Manufacturer's Specifications, performance criteria, Drawings and instructions.

B. Shop Drawings: Submit Manufacturer's complete Shop Drawings showing proposed material, reinforcement, anchorage, fastenings method of installation and UL or Warnock Hersey listing number.

C. Test Reports: Submit UL or Warnock Hersey test report description for firestopping system.

D. Provide certificate of compliance from authority having jurisdiction indicating approval of firestop systems.

E. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Qualifications: Applicator with minimum of 2 years experience with manufacturer's specified product.

B. Regulatory Requirements: Conform to applicable code for fire resistance ratings and surface burning characteristics:
   1. ASTM E 136, ASTM E 119 and ASTM E 814, as applicable.
   2. UL 1479 fire test to achieve required fire-rating as noted on Drawings.
   3. Listing:
      a. UL Fire Resistance Directory (current edition).
      b. WH International Listings

C. Pre-Installation Conference:
   1. Convene a pre-installation conference to review specifications and procedures with the Architect and Resident Engineer, Contractor, installer, manufacturer's representative, Owner and other trades relevant to the work, prior to ordering materials.
   2. Notify Architect and Resident Engineer at least 48 hours prior to starting Work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish firestop systems acceptable to governing Code Authority from one of the following Manufacturers, subject to compliance with Specification requirements:
   1. U.S. Gypsum Co. www.usg.com
   2. Johns-Manville www.jm.com
   3. Tremco, Inc. www.tremcosealants.com
   4. RectorSeal Corporation www.recotrseal.com
   5. 3M Fire Protection Products www.3m.com
   6. Specified Technologies, Inc. www.stifirestop.com
   7. HILTI Firestop Systems www.hilti.com
   8. Nelson Firestop Products www.nelsonfirestop.com
   9. Grace Construction Products – Flamesafe www.grace.com
   10. Or equa.

2.02 MATERIALS

A. Firestop System Materials - General:
   1. Appropriate for penetration.
   2. Include every component required for code approved installation, including; but not limited to:
      a. Firestopping putties or compound.
      b. Backing material.
      c. Wrap strips.
      d. Primers, clips and collars.
      e. Forming and damming materials.
      f. Sealant and solvent cleaner. At interior applications, provide sealant in accordance with the low-emitting materials requirements of Section 01 60 00– Product Requirements.

B. Properties:
1. Free of asbestos, halogens and volatile components after curing and shall not slump or sag, (except for self-leveling products).
2. Capable of maintaining an effective barrier against flames, heat and smoke in compliance with the requirements of ASTM E814, UL 1479 and U.B.C. Standard 7-5.
3. Non-combustible per ASTM E 136.
4. UV resistant where exposed to sunlight.
5. Water resistant where exposed to moisture.
6. Firestop system shall accommodate movement without adversely affecting fire rating of wall/floor assembly.
7. Shrink resistant.
8. Paintable or capable of receiving finish materials in those areas which are exposed to view and which are scheduled to receive finishes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

B. Remove incompatible materials which affect bond.

C. Install backing materials to arrest liquid material leakage, if required.

3.03 INSTALLATION

A. Installation shall conform to requirements of qualified designs or manufacturer approved modifications as supported by engineering reports, and shall be approved and accepted by the authority having jurisdiction.
1. Apply primer and firestop materials in accordance with Manufacturer's instructions and in accordance with the appropriate UL Fire Resistance Directory or with the appropriate Warnock Hersey International Listing.
2. Apply firestopping material in sufficient thickness to achieve rating, to ensure against the passage of flames, smoke and toxic gases, and to a uniform density and texture.
3. Protect materials from damage on surface subjected to traffic and install cover plates as required on firestop system that will or may be subject to traffic.
4. Tool surfaces of firestop products to provide a smooth and clean appearance.

B. Provide firestopping for conditions specified whether or not firestopping is indicated, and, if indicated, whether such material is designated as insulation, safing or otherwise. Insulation types specified in other sections shall not be installed in lieu of firestopping materials.

C. Building Exterior Perimeters:
1. Where exterior facing construction is continuous past a structural floor, and a space (i.e. construction joint) would otherwise remain open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide firestopping to equal the fire resistance of the floor assembly.
2. Mineral wool by itself shall not constitute an acceptable firestop. If mineral wool is part of firestop system, the mineral wool shall be completely covered by appropriate thickness of UL or Warnock Hersey listed firestop sealant.
3. Firestopping shall be provided whether or not there are any clips, angles, plates, or other members bridging or interconnecting the facing and floor systems, and whether or not such items are continuous.
4. Provide firestopping to continuously fill open spaces where an exterior wall of composite type construction passes a perimeter structural member, such as a girder, beam or strut, and the finish on the interior wall face does not continue up to close with the underside of the structural floor above, thus interrupting the fire-resistive integrity of the wall system, and creating a space that would otherwise remain open between the interior face of the wall and lower edge of the structural members.

D. Interior Walls and Partitions:
1. Construction joints between top of fire rated walls and underside of floors above shall be firestopped.
2. Firestop systems installed shall have been tested by either UL or Warnock Hersey, including exposure to hose stream test and including test for use with steel fluted deck floor assemblies.
3. Firestop system used shall allow for deflection of floor or roof above.

E. Penetrations:
1. Penetrations include conduit, cable, wire, pipe, duct or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.
2. Provide firestopping to fill spaces in accordance with ASTM E 814 (UL 1479) where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, except at floors on grade.
3. Requirements for penetrations shall apply whether or not sleeves have been provided. Firestop the annular space between sleeve and surrounding surfaces.

3.04 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 07 92 00

JOINT SEALERS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Related Sections:
1. Section 07 84 00: Sealants at fire penetrations
2. Section 07 92 20: Acoustical sealants.
3. Section 08 80 00: Sealant for butt glazing.

1.02 SUBMITTALS

A. Product Data:
1. Submit manufacturer's current specifications and recommended installation procedures.
2. Submit sample standard warranty to be signed jointly by applicator and manufacturer.
3. Submit manufacturer's standard color chart.

B. Shop Drawings: Illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades.

C. Field Adhesion Test and Stain Reports: Submit copies of logs and test reports showing results of field adhesion testing and stain testing. In lieu of field adhesion test reports, contractor may provide manufacturer's certification that products are suitable for use indicated based on previous testing and successful use.

D. Contract Closeout: Submit Manufacturer's Standard Warranty.

E. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Qualifications: Installers shall be thoroughly trained and experienced in the necessary skills and shall be thoroughly familiar with the specified requirements.

B. Field Adhesion Testing: Perform preconstruction adhesion testing for each type of sealant and substrate as follows:
1. Notify Architect and Resident Engineer at least 7 days prior to date of adhesion testing.
2. Arrange for manufacturer's field technical representative and Architect and Resident Engineer to be present during testing.
3. Install sealant in test joints in minimum 60 inch lengths.
4. Test joints by standard field adhesion hand pull test.
5. For joints with dissimilar substrates, test adhesion to each substrate separately as recommended by sealant manufacturer.

6. Conduct number of field adhesion tests for each type of sealant and each type of substrate as follows:
   a. Not less than 10 tests for the first 1,000 feet of installed sealant and 1 test for each additional 1,000 feet of sealant installed, or 1 test per floor per elevation.
7. Document results of field adhesion tests and record results in field adhesion test log.
8. Include in log data on pull distance used to test each joint sealant.
9. Include data on joints where material connected with pull portion of sealant failed to adhere to joint substrate or tore cohesively.
10. Inspect joints and record data for the following:
    a. Complete fill.
    b. No voids.
    c. Joint dimensions matching those of manufacturer's recommended details.
11. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
12. Do not install joint sealants that fail to adhere to joint substrates during testing.
13. Repair sealant test areas by removing damaged materials and applying sealant to test area using same procedure used to originally install the sealant.

C. Stain Testing: Perform Stain testing of natural stone, masonry and other porous substrates proposed for use in the Work. Obtain actual samples of materials proposed for use and test to determine if permanent discoloration of porous surfaces will occur from direct contact with sealants. Perform stain testing in conformance with ASTM C1248 and as follows:
1. Notify Architect and Resident Engineer at commencement of stain testing procedure.
2. Arrange for manufacturer's field technical representative and Architect and Resident Engineer to be present during examination of test results.
3. Cut substrate to provide flat surface for application of sealant.
4. Separate substrate materials by removable shims to create 1/2 x 1/2 x 3 inch joint.
5. Fill joint with scheduled sealant, tool, and allow to cure for 21 days at room temperature.
6. After 21 day curing, remove shims, compress joint to 50 percent of original joint width to 1/4 inch, and place in an oven at 158 degrees F. for 14 days.
7. After 14 days in oven, remove and allow sample to cool to room temperature.
8. Examine sample to determine presence of discoloration or change in appearance in any way to exposed surfaces.
9. After visual inspection, cut sample in half to determine presence of discoloration or change in appearance in any way into the sample itself at the adhesive bond line and presence of bleeding into the area around the adhesive bond line.
10. Document results of stain tests and record results in stain test log.
11. Do not install sealants that show evidence of staining substrates.

D. Field Color and Workmanship Samples: Caulk a section of joint as directed, under job conditions, at least 7 days prior to start of work for review by Architect and Resident Engineer. When approved, sample shall be used as a standard of comparison for remainder of work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site. Maintain product in accordance with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.

C. Handling: Comply with manufacturer's instructions.

1.05 PROJECT/SITE CONDITIONS

A. Physical Requirements for Proper Installation or Application: Observe manufacturer's temperature service range. Do not apply sealant when weather conditions will inhibit bonding and curing.

1.06 WARRANTY

A. Provide standard warranty, in writing and signed jointly by the installer and sealant manufacturer, to replace sealants which fail at no additional cost to the Owner because of loss of cohesion or adhesion, or do not cure, and which fail to achieve air-tight and water-tight seal as follows:
1. Sealant Types "A" and "B": 5 years.
2. Sealant Types "C1" and "C2": 20 years.
3. Sealant Types "D," "E" and "F": 2 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following manufacturers subject to compliance with specifications requirements:
1. Pecora www.pecora.com
2. Tremco Vulkem Paraseal www.tremcosealants.com
3. Dow Corning Corp. www.dowcorning.com
4. General Electric www.ge.com
5. Sika Corp. www.sika.com
6. Sonneborn / Chemrex www.chemrex.com
7. Or equal.

B. Single Source Responsibility for Joint Sealer Materials:
1. Obtain joint sealer materials from a single manufacturer for each different product required.
2. If sealants from separate manufacturers must be used and could come in contact with each other, provide written certification from every manufacturer involved that the sealants are compatible and will adhere to each other.

2.02 MATERIALS

A. General:
1. Sealants, primers, back-up materials, bond breakers and related materials shall be compatible with adjoining materials.
2. Sealants shall be in accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

B. Sealant:
1. The selection of proper sealant for a particular joint shall be in accordance with current published recommendations of the manufacturer.
2. Types: See Schedule in Part 3 for the location where each type of sealant is to be provided.
a. Type "A": 2-part or 3-part (self-leveling) urethane, conforming to ASTM C920, Type M, Grade P, Class 25, Use T; Pecora NR-200 Urexpan Sealant or Dynatred, Tremco THC-900/901, Vulkem 45/245, Sikaflex 2c SL (self-leveling) Dow Corning Parking Structure Sealant (FC, NS or SL as applicable) and Sonneborn SL-2 or equal.
b. Type "B": 3-part chemically curing polyurethane sealant conforming to ASTM C920, Type M, Grade NS, Class 25, Use NT, M, A, O, and capable of withstanding movement of 50% in extension and compression, and sustained temperatures of 250 degrees F in service. Tremco Dymeric 240 FC Sealant, Pecora Dynatrol II, Vulkem 922, Sikaflex 2c NS (non-sag) and Sonneborn NP-2 or equal.
c. Type "C-1": One-part low modulus moisture cure silicone rubber sealant conforming to FS TT-S-001543A, Class A, FS TT-S-00230C, Type II, Class A and ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, G,A, and O, and capable of withstanding movement of 100% in extension and 50% in compression in service. Dow Corning 790 Silicone Glazing Sealant, Tremco Spectrem 1 and Pecora 890 or equal.
d. Type "C-2": One-part medium modulus neutral cure silicone rubber sealant conforming to FS TT-S-001543A, Class A, FS TT-S-00230C, Type II, Class A and ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, G,A, and O, and capable of withstanding movement of 50% in extension and 50% in compression in service. Tremco Spectrem 2, Pecora 895, Dow Corning 795, Dow Corning 791, and GE Silpruf or equal.
e. Type "D": ASTM C920, Type S, Grade NS, Class 25, Use NT, M,A,O. Sika Sikaflex 1A, Pecora Dynatrol 1, Tremco DyMonic FC, Pecora 345 and Sonneborn NP-1 or equal.
f. Type "E": Silicone rubber sealant with mold inhibitor. General Electric Sanitary 1700, Tremco Tremsil 200, Dow Corning 999, Pecora 898, Sonneborn Omni-Plus or equal.
3. Sealants at fire penetrations: As specified in Section 07 84 00
4. Color: Provide standard or custom colors as selected by Architect and Resident Engineer. In general, colors shall match adjacent materials.

D. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

E. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

F. Joint Filler (Backer): ASTM D1565; round closed cell polyethylene, urethane or neoprene foam rod; oversized 30 to 50 percent; "SofRod" as manufactured by A.E.T. or equal.

G. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

H. Gloss Reducer: Silica sand No. 20, color to match adjacent surface. Gloss reducer shall be provided at traffic sealant applications.

I. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the sealant manufacturer as compatible, subject to the review of the Architect and Resident Engineer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces. Verify, before proceeding with this Work, that required inspections of existing conditions have been completed.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

A. Clean, prepare, and prime joints in accordance with manufacturer's instructions. Remove loose materials and other foreign matter which may impair adhesion of sealant.

B. Verify that joint shaping materials and release tapes are compatible with sealant.

C. Examine joint dimensions and size materials to achieve required width/depth ratios.

D. Use joint filler to achieve required joint depths, to allow sealants to perform properly.

E. Use bond breaker where required.

F. Protect adjacent surfaces from damage by masking when necessary.

3.03 INSTALLATION

A. General:
1. Install sealant in accordance with manufacturer's instructions.
2. In general, seal openings and other locations which normally require sealant to seal against infiltration from air, water and most insects, including; but not limited to:
   a. Construction and expansion joints.
   b. Joints between dissimilar materials.
   c. Joints around windows, door frames, louvers and other penetrations and openings in the exterior wall.
   d. Interior wall openings.
   e. Other locations indicated on drawings.
3. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges.

B. Joints:
1. Free of air pockets, foreign embedded matter, ridges, and sags.
2. Tool joints concave.

C. Apply sealant under pressure with hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed.

D. Neatly point or tool joint surfaces to provide slightly concave surfaces, free of wrinkles and skips, uniformly smooth and with perfect adhesion along both sides of joint.

3.04 CLEANING

A. Clean adjacent surfaces of sealant as work progresses.

B. Use solvent or cleaning agent as recommended by sealant manufacturer.

C. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

D. Construction Waste: In accordance with Section 01 74 19

3.05 SCHEDULE

A. Expansion and Control Joints:
1. Horizontal traffic: Type "A". Provide gloss reducer.
2. Masonry, concrete to concrete, stucco, steel and wood:
   a. Exterior: Type “C-1” or “C-2” as recommended by manufacturer.
   b. Interior: Type "B".
3. Glass (except insulating glass or special coated glass), aluminum, E.I.F.S., Natural Stone, and plastics: Type "C-1".
4. Glass (including insulating glass or special coated glass), aluminum and plastics: Type "C-2".

B. Non-expanding Joints:
1. Glass (except insulating glass or special coated glass), aluminum, E.I.F.S., Natural Stone, and plastics: Type "C-1".
2. Glass (including insulating glass or special coated glass), aluminum and plastics: Type "C-2".
3. Concrete to concrete, stucco, masonry, aluminum, steel, and wood:
   a. Exterior: Type “C-1 or “C-2” as recommended by manufacturer:
   b. Interior: Type "D".

C. Mechanical (ductwork and air conditioning):
1. Exterior: Type “C-1 or “C-2” as recommended by manufacturer:
2. Interior: Type "D".

D. Plumbing Fixtures (around toilet, bath, kitchen fixtures, and food service equipment): Type "E".

E. Acoustical (acoustical applications where sealant is required): In accordance with Section 07 92 20.

END OF SECTION

SECTION 07 92 20

ACOUSTICAL SEALANT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Acoustical sealants to be installed in wall j-boxes penetrations, sill plates, walls meet structural ceiling, piping penetrations to guard against unwanted noise transfer.

B. Related Sections:
1. Section 07 92 00 – Joint Sealers.
2. Section 09 29 00 – Gypsum Board: Installation of acoustical sealant simultaneously to installation of gypsum wallboard.

1.02 SUBMITTAL

A. Samples: Acoustical sealant materials to be utilized shall be submitted to the Architect and Resident Engineer for approval.

B. Product Data: Catalog cuts shall be submitted to the Architect and Resident Engineer for approval.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

PART 2 PRODUCTS

2.01 MATERIAL DESCRIPTION

A. General:
1. Where indicated on the drawings and/or described in the specifications, acoustical sealant shall be provided to prevent the transmission of airborne sound through cracks in the construction.
2. Provide materials that comply with requirements of Indoor Environmental Quality and Material Emissions specified in Section 01 60 00.

B. The acoustical sealant compound shall be of the non-hardening polysulphide type, or elastic water-base type. The sealant shall be one of the following:
1. Pecora Corp. AC-20 FTR Acoustical and Insulation Sealant
2. Tremco Acoustical Sealant
3. United States Gypsum Sheetrock Acoustical Sealant
4. Or equal.

C. Backer Rod shall be polyethylene type “Sof Rod” as manufactured by Applied Technologies, Inc. or equal. It shall be closed cell, polymeric type with a density of 2.5 PCF and a tensile strength of 35 PSI.

D. Removable expanding Silicone Foam shall be Dow Corning 3-6548 Silicone RTV Foam or equal.

E. Pillow Pads shall be Metacaulk Firestop Pillows as manufactured by Rectorseal or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Apply sealants per manufacturer's written instructions.

B. Clean surfaces as required for proper adhesion of sealants.

C. Seals shall provide an "air tight" closure to the surface or material being sealed similar to that required for fire rated construction.

D. Seal gypsum board to floor, ceiling, metal deck, concrete, etc.

E. Apply 1/4-inch minimum rounded bead around penetrations and openings in gypsum board including outlet boxes, cable penetrations, pipes, HVAC ducts, structural members, etc. so that the wall, partition or ceiling becomes an "air tight" enclosure to the adjacent space.

F. Provide continuous backer rod behind sealant at joints 3/8-inch or larger.

G. Sealant shall be a minimum of 1/4-inch deep in joint.

H. All gaps larger than 1/2-inch shall first be covered with gypsum board, lapped a minimum of 2-inches and screwed before using acoustical sealant.

I. Provide fire rated acoustical sealant where required in fire rated assemblies.

J. At penetrations requiring access, such as cable trays or open conduit for signal wires, fill openings at point of penetration with a removable expanding silicone foam or pillow pads.

END OF SECTION

SECTION 08 11 13

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings: Submit Drawings showing elevations of each door and frame type, typical and details of construction, location and installation requirements for hardware, size and thickness of material.

B. Fire Rated Doors and Frames:
1. Installation Instructions: Door and frame manufacturer shall clearly identify the hardware products, other materials and work requirements necessary to maintain compliance with UL 10(c) (positive pressure testing) as required by IBC Section 714.
2. Certification: Submit certification that fire rated doors (including frames and hardware as a unit) will comply with UL 10(c) (positive pressure testing) as required by IBC Section 714.

C. Furnish recognized independent test lab certification that products comply with ANSI A250.4,

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 DELIVERY AND STORAGE

A. Deliver welded frames with spreaders and doors with wrappers.

B. Store doors and frames under protective cover in dry, enclosed spaces at the site. Place doors and frames on non-staining blocking Raise bottoms of doors at least 4 inches high and provide 1/4 inch air space between stacked doors to avoid metal to metal contact and permit air circulation.

1.03 QUALITY ASSURANCE

A. Doors and frames shall be certified to comply with ANSI A250.4, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing, and ANSI A250.8, Recommended Specifications for Standard Steel Doors and Frames.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish steel doors and frames from one of the following Manufacturers subject to compliance with Specification requirements:
1. Steelcraft Manufacturing Co.
2. Curries Company www.curries.com
3. The Ceco Corporation www.cecodoor.com
4. The Kewanee Corp. www.kewaneecorp.com
5. Republic Builders Products www.republicdoor.com
6. Fleming Steel Doors and Frames
7. Or equal.

B. Doors and frames shall be furnished by the same Manufacturer.

2.02 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide regional materials in accordance with Regional Materials provisions of Section 01 60 00.

B. Doors: Furnish Level, Model and Physical Performance level in accordance with ANSI A250.8/SDI-100.
1. Level: Level 2, 18 gauge.
2. Physical Performance: Level B.
3. Model: Model 1, Full Flush.

C. Core: Honeycomb, Polystyrene, Polyurethane or Vertical steel stiffener core as applicable. Core shall be as allowed by UL 10(c) for fire rated doors.

D. Frames: ANSI A250.8/SDI 100, 16 gauge steel, fully welded. Exterior frames shall be thermally broken and insulated.
1. Thermal Breaks (Exterior Frames): Rigid polyvinylchloride (PVC) extrusion.
2 Fiberglass Insulation (Exterior Frames): Loose batt type, density: 1.5 pcf (24kg/m_3) (minimum), conforming to ASTM C665.

E. Glazing Beads: Minimum 20 gauge steel.

F. Steel: ASTM A1008 cold-rolled or ASTM A1011 hot-rolled. Hot-dip galvanized meeting ASTM A653, Grade G60 for exterior openings.

G. Paint:
1. Non-lifting, rust-inhibitive grey primer meeting ANSI A224.1, compatible with field finish specified in Section 09 91 00, applied after bonderizing.
2. See also Section 09 91 00 for requirements regarding paints for compliance with LEED™ requirements.
3. Finish paint color to be coordinated with adjacent finishes as directed by Architect and Resident Engineer.

2.03 FABRICATION- DOORS

A. Construct hollow metal doors, flush and vision lite types as scheduled on Drawings, in accordance with ANSI A250.8/SDI-100 with core as specified above. Reinforce top and bottom of doors horizontally by 16 gauge steel channels, full width, spot welded to each face at least 3 inches on center. Bevel edge of lock stile.

B. Door Edge Joint and Treatment: Joints at the edges of doors shall have manufacturer's standard edge construction with seam edge filled, dressed smooth.

C. Where heavy duty hinges have been specified, provide 7 gauge or equivalent reinforcing at hinge cut outs. Coordinate with hardware schedule.

D. Exterior Doors: Close top and bottom edges of all exterior doors flush as an integral part of the door construction, or by placing end closure channel with web of channel flush with top and bottom edge of door (not inverted), or by addition of end cap at top and bottom of door, spot welded to each face at least 3 inches on center, filled and dressed smooth.

E. Reinforce openings in doors for lites and vents on all sides with 14 gauge steel channel.

F. Provide non-egress double doors with one-piece astragals of 14 gauge steel unless otherwise indicated or scheduled. Provide solid drip cap at top of exterior out-swinging doors.

G. Accurately mortise doors for locks and hinges. Provide adequate box type reinforcement with steel plates welded to the interior reinforcing channels and drilled and tapped. Provide reinforcement for all other items of hardware.

H. Doors with glass lite openings shall have trim recessed from the face of the door, beveled and attached with screws.

I. Fire-Rated Doors: Provide fire rated doors investigated and tested as fire door doors, complete with type of hardware to be used. Identify each fire door with recognized testing laboratory labels, indicating applicable fire rating of steel doors. Doors required to meet smoke and draft control assembly requirements shall have labels that identify that the door has been tested and approved for smoke and draft control assemblies (S-label). Construct doors to comply with NFPA Standard No. 80 and UL-10(c).

2.04 FABRICATION - FRAMES

A. Construct to shapes and sizes specified or shown, meeting various wall thicknesses in accordance with ANSI/SDI-100.

B. Weld, fill, grind and dress smooth face frame miters.

C. Mortise, reinforce, drill and tap for standard weight, full mortise template hinges and template strike.

D. Provide not less than three 18 gauge anchors per jamb, or as shown on Drawings, spaced for maximum stiffness. Provide adjustable 18 gauge floor clips at each jamb, welded to back face of jamb, punched for securing to floor with two spaced anchors.

E. Make cutouts for required hardware specified under Section 08 71 00, from templates furnished. Reinforce butt cutouts with minimum 8 gauge thick steel plate drilled and tapped and welded in place. When heavy duty hinges are specified, provide high frequency reinforcing at frames for hinges. Coordinate with hardware vendor. Provide strike stops of frames with holes for three rubber door silencers; on double door frames, provide for two silencers per door at head.

F. For openings over 42 inches wide and at double openings, reinforce head members full length with a matching profile of 12 gauge steel. Provide anchor at midpoint of door, if practical.

G. Construct frames for UL labeled doors in accordance with UL requirements and label as scheduled. Frames required to meet smoke and draft control assembly requirements shall have labels that identify that the frame has been tested and approved for smoke and draft control assemblies (S-label).

H. Exterior frames shall be thermally broken
1. Thermally broken sections shall not be assembled by means of screws, grommets or other fasteners.
2. Where thermally broken set-up and welded frame product is specified, welds shall not cause thermal transfers between interior and exterior surfaces of the frame sections.
3. Closed sections (mullions and center rails) of thermally broken frame product shall be factory insulated with 1.5 pcf (24kg/m3) loose batt type fiberglass material.
4. Insulation of open sections (jambs, heads and sills) shall be provided and installed by the contractor responsible for installation.

2.05 FABRICATION - GLAZING FRAMES

A. Construct in accordance with applicable parts of door frame Specification and as detailed. Extend partition frames around all four sides of openings.

B. Provide glazing stops, removable one side and integral from the other side, secured with countersunk flat head Phillips screws spaced at not more than 16 inches on center and 2 inches from corners. Miter stops at corners.

2.06 FABRICATION TOLERANCES

A. Allowable Tolerances for Fabrication: As specified in ANSI/SDI-117, Manufacturing Tolerances Standard Steel Doors and Frames.

2.07 PAINTING

A. Bonderize and prime doors and frames with one shop coat of rust inhibitive primer.

B. Finish painting in accordance with Section 09 91 00.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install metal door frames plumb, level, rigid and in true alignment as recommended in SDI 105 and ANSI/DHI A115.IG.

B. Install doors and fasten to maintain alignment with frames to achieve maximum operational effectiveness and appearance.
   1. Maintain clearances as specified in ANSI A250.8, 2.1.8.
   2. Shim as required per NFPA 80, ANSI/A115.IG and SDI 122.

C. Fill backs of frames solid with mortar at concrete and masonry construction, unless otherwise directed. Anchors for exterior frames shall be designed so as not to permit thermal transfers from exterior to interior surfaces of the frame sections.

D. Install fire doors and frames to comply with NFPA 80 and in accordance with manufacturer's printed instructions.

E. Prepare and install doors in accordance with ANSI A115 and SDI 122.

3.02 FIELD QUALITY CONTROL

A. Manufacturer's representative shall inspect fire rated doors (including frames and hardware as a unit) and verify compliance with UL 10C (positive pressure testing) as required by IBC Section 714. Fire rated doors (including frames and hardware as a unit) which do not comply with UL 10C (positive pressure testing) as required by IBC Section 714 shall be removed and replaced at no additional cost to Owner.

3.03 CLEANING

A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19 .

END OF SECTION

SECTION 08 14 00

WOOD DOORS

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings: Submit Drawings showing schedule of door sizes and types, door details and elevations. Note discrepancies between the Drawings and door schedules, and the requirements of regulatory and testing agencies.

B. Product Data: Submit Manufacturer's data showing door construction.

C. Samples: Before fabrication, submit sample of each type of door to be furnished, showing face, edge, core construction and factory finish for each type specified.

D. Fire Rated Doors:
1. Installation Instructions: Door manufacturer shall clearly identify the frame, hardware products, other materials and work requirements necessary to maintain compliance with UL 10(c) (positive pressure testing) as required by IBC Section 714.
2. Certification: Submit certification that fire rated doors (including doors, frames and hardware as a unit) will comply with UL 10(c) (positive pressure testing) as required by IBC Section 714.

E. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 QUALITY ASSURANCE

A. Coordination: Contractor shall be responsible for coordinating and obtaining necessary information from Hardware and Metal Frame Manufacturers. Door Manufacturer shall be responsible for coordinating necessary information received by Contractor from Hardware and Metal Frame Manufacturers in order that doors shall be properly prepared to receive hinges and hardware. Contractor shall provide door supplier with approved frame schedule, hardware schedule, and hardware templates. Furnish to door supplier 60 days prior to desired delivery date of doors.

B. Regulatory Requirements: Fire doors shall be listed and labeled by a nationally recognized testing and certification agency, in accordance with applicable building codes. Doors required to meet smoke and draft control assembly requirements shall have labels that identify that the door has been tested and approved for smoke and draft control assemblies (S-label). The listed doors shall meet or exceed ASTM E2074, UL-10(c) (positive pressure testing), Category A and NFPA 252 (September 1999) with all requirements as part of door construction (no additional edge sealing required). Provide fire labels from Warnock-Hersey International (WHI), or Underwriters Laboratories (UL).

C. Certification: Provide each fire rated and sound rated door with a label permanently attached at eye level, to the hinge stile or, where interfering hardware such as full length hinges are applied, in a location acceptable to the local Code Authority, indicating the testing agency's approval for the rating required. Do not cover or conceal label.

1.03 DELIVERY, STORAGE AND HANDLING

A. Prior to delivery, provide protection compatible with finish specified for door edges and faces.

B. Delivery:
1. Deliver doors to the jobsite only when proper storage site is available.
2. Store doors in an area having controlled temperature and humidity as recommended by NWWDA, AWI or WI and the door manufacturer.
3. Store doors flat on factory pallets, or three full 2 x 4's, one centered and the other two 12 inches from each end. Do not stack doors on end, or on their vertical edge.
4. Protect wood doors from construction activity, dirt, and exposure to sunlight.

C. Handling:
1. Always handle doors with clean hands or gloves.
2. Do not drag doors across one another.
3. Maintain factory packaging or other means of protection on doors, until date of Substantial Completion.

1.04 WARRANTY

A. Warranty: Furnish the following manufacturer's standard warranty to Owner:
1. Warrant doors from the date of installation against defects in materials and workmanship. Periods of warranty after date of installation:
a. Interior solid core and mineral core: Life of installation.
b. Interior hollow core: 5 years.
2. Replacement under warranty shall include removal of the defective door, hanging, installation of hardware, and finishing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Doors shall be products of one of the following Manufacturers:
1. Algoma www.algomahardwoods.com
2. Buell Door Company www.buelldoor.com
3. Eggers Industries www.eggersindustries.com
4. Marshfield Door Systems www.marshfielddoors.com
5. Lambton www.lambtondoors.com
6. Oshkosh Architectural Door Company www.oshkoshdoor.com
7. Graham www.grahamdoors.com
8. Or equal.

2.02 MATERIALS - GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

2.03 FLUSH DOORS

A. Wood - General: Wood and agrifiber products must contain no added urea-formaldehyde resins in accordance with the requirements of "Low Emitting Materials" as specified in Section 01 60 00 - Materials and Equipment.

B. Cores - Solid Core: Staved lumber core. No formaldehyde content allowed.

C. Edge Bandings:
1. Stiles (Dimensions given are minimum sizes allowed after factory trimming to booksize or prefitting) - Particleboard Core: 1-1/2 inch double banded laminated hardwood stile, laminated strand lumber or structural composite lumber (no finger joints allowed) in inner and outer band to be at least 1/2 inch wide same species lumber as face veneer with the exception of birch doors which will have hard maple stiles.
2. Rails (Dimensions given are minimum sizes allowed after factory trimming to booksize or prefitting) - Particleboard Core: 1-1/4 inch minimum mill option hardwood rail. For doors scheduled to receive closers, provide minimum 5 inch solid wood top rail.

D. Face Veneers, Crossbands and Backers: Doors shall be securely bonded together utilizing type 1 (fully waterproof) adhesive (compliant with the low-emitting materials requirements of Section 01 60 00 – Product Requirements) and the hot press assembly technique. All plies must be placed at right angles to adjacent plies. Doors manufactured by cold-pressing 2 or 3-ply pre-manufactured door skins to multiple cores in the same press shall not be acceptable.
1. Plastic laminate faced doors shall be a minimum 3-ply construction for particle core doors and minimum 5-ply construction for mineral core doors.
   a. Laminate shall be NEMA LD-3, .050 inch, General Purpose Type, selected from Manufacturer's available sources. Color to be Carmel Sagawood textured" WM-8-350T by Nevamar as scheduled on Drawings.
   b. Stile edges and outer wood trim shall be mill option hardwood stained or painted to match or mill option hardwood faced with matching plastic laminate.
   c. Particle board (wood and agrifiber products) must contain no added urea-formaldehyde resins in accordance with the requirements of "Low Emitting Materials" as specified in Section 01 60 00 – Product Requirements.
2. Paint Grade:
   a. Furnish Medium Density Overlay for paint grade doors. MDO shall meet PS1-74.
   b. Overlay shall be factory primed, readily sandable, weatherproof, and carry a Class "B" Fire Rating.
   c. Paint grade Birch hardwood and hardwood surfaced doors shall not be considered as meeting this Specification.
   d. Paint finish to be as scheduled on Drawings and shall be applied in accordance with Section 09 91 00 requirements.

E. Glue:
1. Type 1 per NWWDA/WDMA T.M.-6 for interior and exterior doors.
2. In accordance with the low-emitting materials requirements of Section 01 60 00 – Product Requirements.

2.04 LABELED FLUSH DOORS

A. Mineral core flush veneered doors, 5-ply, shall be made up of face veneers, crossbanding, and a core unit securely bonded together utilizing Type I (fully waterproof) adhesive (compliant with the low-emitting materials requirements of Section 01 60 00 – Product Requirements)and the hot press assembly technique. Provide matching transom panels where scheduled.

B. Face Veneers and Crossbanding: Same as specified for non-labeled doors.

C. Core Unit: Asbestos free, noncombustible mineral composite with a minimum of 28 pounds per cubic foot) density when tested in accordance with ASTM C303, with 10 percent maximum absorption by weight with core in equilibrium at 90 percent relative humidity and 70 degrees F.. Provide flame resistant blocking as required by the hardware schedule. The door listing shall not limit the size or location of such blocking.
1. Provide one lock block 5 inches x 12 inches when a bored unit or mortise lock is to be used and two lock blocks when the door is equipped with an exit device.
2. For doors with closers include 6 inch top rail. Provide wide bottom rails for exit, manual and automatic flush bolts and automatic door bottoms.

D. Rails: Top 15/16 inch, bottom 1-7/8 inches rail (one or two piece) of flame resistant material - salt free. Securely glue rails to core. For doors scheduled to receive closers, provide minimum 5 inch solid wood top rail.

E. Stiles: Manufacturer's standard for receiving a full mortise hinge. No salt treated components shall be used. UL or WH approved for labeled doors meeting the following performance criteria:
1. Split Resistance: Average of ten test samples shall be not less than 900 load pounds when tested in accordance with "Test Method to Determine Split Resistance of Hinge Edges of Composite Type Fire Doors."
2. Direct Screw Withdrawal: Average of ten test samples shall be not less than 650 load pounds when tested for direct screw withdrawal in accordance with ASTM D1037; using a No. 12 x 1-1/4 inch steel thread-to-the-head wood screw of the cadmium plated or rust-resistant type. Drill 5/32 inch pilot hole, approximately 1/8 inch beyond the length of the screw.
3. Cycle/Slam: 200,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with the requirements of ANSI A151.1, Section 2.5.

F. Vision Frames: Provide one of the following.
1. Furnish metal vision frames primed for field painting for doors with lites. Frames shall meet AWI standard, UL, or WHI approved.
2. Furnish Marshfield Door Systems "Trim-lite" 20 minute wood molding system with flush or lipped bead moulding profile or equal as selected by Architect and Resident Engineer, or Algoma Veneer wrapped wood bead, fire-rated for 45, 60 and 90 minutes or equal.

G. Manufacture labeled doors to the required size so as to provide proper clearances without field trimming. Machining of labeled doors must be completed before label is applied to assure the full thickness of the edge bands. Machine fire doors to meet NFPA 80 requirements. Provide channels for concealed exit devices specified in Section 08 71 00 and in conformance with UL requirements.

H. Meeting edges on pairs of labeled doors:
1. Treated stiles at pairs of 20 minute doors.
2. No metal edge or astragal at pairs of 45, 60 or 90 minute door. Furnish "Pair Guard" door as manufactured by Marshfield Door Systems or equal with surface mounted vertical rods on each leaf.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine door frames to assure that jambs are true and plumb. Correct frames which are not true and plumb before doors are hung.

3.02 INSTALLATION

A. Doors shall be hung true and plumb with standard bevel and with uniform 3/32 inch clearance at jambs and head, and 1/2 inch bottom clearance, unless otherwise required. Mortise, drill or otherwise prepare doors for finish hardware specified in Section 08 71 00, Finish Hardware. Pilot drill screw and bolt holes.

B. Doors that are cut or planed for fitting shall be immediately resealed with a transparent wood sealer. Doors shall operate freely without sticking or binding, without hinge-bound conditions and with hardware installed, properly adjusted and functioning.

C. Install fire doors and frames to comply with NFPA 80 and in accordance with manufacturer's printed instructions.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's representative shall inspect fire rated doors (including frames and hardware as a unit) and verify compliance with UL 10C (positive pressure testing) as required by IBC Section 714. Fire rated doors (including frames and hardware as a unit) which do not comply with UL 10C (positive pressure testing) as required by IBC Section 714 shall be removed and replaced at no additional cost to Owner.

3.04 CLEANING

A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings: Submit Drawings showing sizes, construction and installation details.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage and Protection: Deliver and store items in dry, protected areas. Adequately protect against damage while stored at the site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following Manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with Specification requirements:
1. Babcock-Davis (Cierra Products) www.babcockdavis.com
2. Nystrom Building Products www.nystrom.com
3. Karp Associates www.karpinc.com
4. J.L. Industries www.jlindustries.com
5. Milcor Inc. www.milcorlp.com
6. Or equal.

2.02 ACCESS DOORS

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Doors: Sizes as shown on the Drawings. Units shall be prime painted steel at painted wall construction and stainless steel in tile and other locations as indicated, in types as required by wall construction, as follows (based on Babcock-Davis):
1. Non-Rated Access Panels:
   a. Drywall Walls and Ceilings: Babcock-Davis B-NW access panel or equal.
   b. Masonry, Tile Walls, Etc.: Babcock-Davis B-NT access panel or equal.
   c. Acoustical Tile: Babcock-Davis B-RA access panel or equal.
2. Fire-Rated Access Panels:
   a. Drywall Walls and Ceilings: Babcock-Davis B-IW, Insulated, Fire-Rated access panel or equal.
   b. Masonry, Tile Walls, Etc.: Babcock-Davis B-UT, Insulated, Fire-Rated access panel or equal.

C. Door and Frame: 16 gage steel. Provide key operated cylinder lock with additional screw driver operated cam locks in sufficient quantity as recommended by manufacturer to hold door in flush closed position. 16 gage steel shall be used for door and frame. Type K door shall have concealed spring hinges to allow door to open a minimum of 175 degrees. Size as required or as indicated on the Drawings.

D. Access Doors in Fire Rated Construction:
1. Doors shall be UL or Warnock Hersey labeled and meet self-closing and self-latching requirements for fire rated ceiling assembly.
2. Doors shall be UL 1-1/2 hour fire rated when located in a fire rated wall assembly.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install access doors in accordance with Manufacturer's directions at locations shown on Drawings or necessary for access to valves, dampers and other devices or equipment requiring periodic access. Do not install panels in locations where frame will extend over transition between two separate wall or ceiling finish materials (i.e. tile to gypsum board).

B. Install plumb and level, true to line.

3.02 CLEANING

A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 08 36 13

SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following types of sectional overhead doors:
   1. Doors with aluminum-framed aluminum panels and light inserts.
   2. Tracks configured for Standard lift.

1.02 DEFINITIONS

A. Operation Cycle: One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back to the closed position.

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide sectional overhead doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:
   1. Wind Load: Uniform pressure (velocity pressure) of 201bf/sq. ft., acting inward and outward. Deflection of door in horizontal position to be maximum 1/120" of door width.

B. Operation-Cycle Requirements: Design sectional overhead door components and operator to operate for not less than 100,000 cycles.

1.04 SUBMITTALS

A. Product Data: For each type and size of sectional overhead door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:
   1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
   2. Motors: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.

B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.
   1. Wiring Diagrams: Detail wiring for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring and between components provided by door manufacturer and those provided by others.

C. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below and of same thickness and material indicated for Work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
   1. Frame: 6-inch length.
   2. Panel: 6 inches square.

D. Manufacturers' Certificates: Signed by manufacturers certifying that materials supplied comply with requirements specified in "Quality Assurance" Article. On request, submit evidence of manufacturing experience.

E. Installer's Qualifications: Provide information which verifies quality assurance requirements for the installer.

F. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an authorized dealer of the sectional door manufacturer for both installation and maintenance of units required for this project. Installer shall have at least 2 years of experience with projects similar in nature and size to the subject projects

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing sectional overhead doors similar to those indicated for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain sectional overhead doors through one source from a single manufacturer except that door operators may come from a manufacturer other than the door manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of sectional overhead doors and accessories and are based on the specific system indicated. Other manufacturers' systems with equal performance and dimensional characteristics may be considered.

E. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

1.03 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

1.04 PROJECT/SITE CONDITIONS

A. Field Measurements: Verify existing conditions by taking field measurements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide doors by Raynor Garage Doors or equal.

2.02 MATERIALS AND ACCESSORIES – GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

2.03 ALUMINUM SECTIONS

A. General:
1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Color and Gloss: Armor Brite - powder coat from manufacturer's standard colors by Raynor or equal as selected by Architect and Resident Engineer.

B. Sections shall be 2" (50.8mm) thick 6036-T6 aluminum alloy frame with .050 (1.3mm) thick aluminum panels. Stiles and rails to be joined together with 5/16" (7.9mm) galvanized throughbolts. Panels to be completely encased in soft vinyl channels and held in place with a snap-in extruded aluminum retainer. Bottom rail to be 5-1/8" (130.2mm), top rails 3-1/4" (82.5mm). The combined dimension of the two meeting intermediate rails shall be 3-3/4" (95.2mm). End stiles shall be 3-1/4" (82.5mm) or 6-1/4" (158.7mm) wide, depending on door size. Center stiles to be 3-5/8" (92.1 mm) wide.

2.04 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Provide manufacturer's standard normal headroom, galvanized steel track system, sized for door size and weight, designed for lift type indicated and clearances shown, and complying with ASTM A 653, for minimum G60 zinc coating. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing rollers for required door type and size. Slope tracks at proper angle from vertical or otherwise design to ensure tight closure at jambs when door unit is closed. Weld or bolt to track supports.

B. Track Reinforcement and Supports: Provide galvanized steel track reinforcement and support members, complying with ASTM A 36 and ASTM A 123. Secure, reinforce, and support tracks as required by industry and Title 24 standards-(including seismic criteria), for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors. Provide all seismic bracing required by code.

C. Support and attach tracks to opening jambs with continuous angle bolted to tracks and attached to wall. Support horizontal (ceiling) tracks with continuous angle welded to track and supported by laterally braced attachments to overhead structural members at curve and end of tracks.

D. Track: Track shall be 2" deep for doors up to 20' wide and shall be 3" deep for doors over 20' wide: with hot-dipped galvanized finish. Vertical tracks to be continuous angle mounted and fully adjustable for sealing door to jamb. Continuous angle size to be not less than 2-5/16" x 4" x 3/32" on 2" track, or not less than 3-1/2" x 5" x 1/8" on 3" track. Horizontal track to be adequately reinforced with continuous angle.

E. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene.
1. Provide motor-operated doors with combination bottom weather-seal and sensor edge.
2. Provide continuous flexible seals at door jambs and head for weather-tight installation.

F. Glazing: Sections may be furnished with factory-Installed 24 inch x 8 inch lite inserts with rounded corners set into the aluminum panels and held in place with black rubberized gaskets utilizing the following glazing materials:
1. Clear Polycarbonate Plastic: 3-mm clear, transparent, polycarbonate sheet manufactured by extrusion process.

2.05 HARDWARE

A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Provide heavy-duty galvanized steel hinges, of not less than 0.0747-inch- thick uncoated steel, at each end stile and at each intermediate stile, per manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges, where required, for doors exceeding 16 feet in width.

C. Rollers: Provide heavy-duty rollers, with minimum 10 steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- diameter roller tires for 3-inch track, 2inch- diameter roller tires for 2-inch track, and as follows:
1. Case-hardened steel tires.

2.06 COUNTERBALANCING MECHANISM

A. Torsion Spring: Operation by torsion-spring counterbalance mechanism consisting of adjustabletension torsion springs, fabricated from oil-tempered-steel wire complying with ASTM A 229, Class II, mounted on a continuous solid steel shaft. Connect to door with galvanized aircraft-type lift cables with cable safety factor of at least 5 to 1. Provide springs calibrated for 100,000 cycles minimum,

B. Cable Drums: Provide cast-aluminum or gray-iron casting cable drums grooved to receive cable. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft. Provide 1 additional midpoint bracket for shafts up to 16 feet long and 2 additional brackets at one-third points to support shafts more than 16 feet long, unless closer spacing is recommended by door manufacturer.

C. Bracket: Provide anchor support bracket, as required to connect stationary end of spring to the wall, to level shaft and prevent sag.

2.07 ELECTRIC DOOR OPERATORS

A. General:
1. Provide electric door operator assembly of size and capacity recommended by door manufacturer for door and operational life specified, complete with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for complete and proper operation.
2. Apparatus doors shall have the ability to have a manual override enabling the door to be opened manually in less than 1.5 minutes.

B. Comply with NFPA 70.

C. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

D. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24V, ac or dc.

E. Door-Operator Type: Provide unit as manufactured by R&S Automation, consisting of electric motor and the following:
1. Gear-head trolley type, with enclosed worm-gear running-in-oil primary drive, chain and sprocket secondary drive, and quick disconnect-release for manual operation. Disconnect to have 1/8" cable minimum.
2. Mount disconnect and operator so they are accessible from floor level.

F. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors, complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than 2/3 fps and not more than 1 fps, without exceeding nameplate ratings or considering service factor.
1. Type: Polyphase, medium-induction type.
2. Service Factor: According to NEMA MG 1, unless otherwise indicated.
3. Refer to drawings for wiring requirements and electrical characteristics of motors.

G. Remote-Control Station: Provide momentary-contact, 3-button control station with push-button controls labeled "Open," "Close," and "Stop." The "Stop" button shall be disabled.
1. Provide interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
2. Door are to be able to be operated both at push buttons located by each door, a master control panel adjacent to the main apparatus floor door entry.
3. Door operators shall be compatible with Linear Delta III controller receiver. The receiver antenna shall be located to receive a signal from the street.

H. Obstruction Detection Device: Provide each motorized door with indicated external automatic safety sensor able to protect full width of door opening. Activation of sensor immediately stops and reverses downward door travel.
   1. Sensor Edge: Provide each motorized door with an automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward door travel.
      a. Provide the following components as manufactured by Miller Safety Edge and Linear Corporation operators/receivers/transmitters including universal wireless receiver/transmitter with alarm for low battery levels:
         1. "Miller Edge" ME-123 or approved equal, including universal 4-wire fail safe.
         2. DRG-2r Receiver.
      b. Self-Monitoring Type: Provide self-monitoring, 4-wire configured device.
   2. Each door shall have a separate electric eye and electrical safety device to prevent contact with fire apparatus. Eyes shall be set 2.5 feet above floor to intersect the vehicle bumper.

I. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

J. Radio Control: Provide radio control system consisting of the following:
   1. Linear Corp, Model DR receiver (one each per door).
   2. Linear Corp, Model DT2A transmitter (two each per door).

K. Safety Strobe: During operation each door shall have a safety strobe indicated while the door is opening to full height.

L. Doors shall have a light-base signal system, alerting the driver when the door Is fully open (green) and not fully open (red).

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine wall and overhead areas, including opening framing and blocking, with Installer present, for compliance with requirements for installation tolerances, clearances and other conditions affecting performance of Work of this Section.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Install door, track, and operating equipment complete with necessary hardware, jamb and head mold strips, 'anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified. Provide all blocking between ceiling joists as required for secure support of guide rails, etc. Contractor shall provide all adjustments, miscellaneous intermediate framing, supports blocking, etc. as required to accommodate existing conditions and necessary to provide complete and fully-functional and operational sectional door system at each location indicated.

B. Fasten vertical track assembly to framing at not less than 24 inches o.c. Hang horizontal track from structural overhead framing with angle or channel hangers welded and bolt fastened in place. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipments. All new work shall be installed plumb and level.

C. Doors shall be wired to the emergency electrical circuit to facilitate continuous operation. Cut-off switch shall be installed at each door within reach, for maintenance and repair purposes.

3.03 ADJUSTING AND CLEANING

A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weather-tight for entire' perimeter.

B. Construction Waste: In accordance with Section 01 74 19 .

3.04 DEMONSTRATION

A. Startup service; Engage a factory-authorized representative to perform startup services and to train Owner's maintenance personnel as specified below:
1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventative maintenance.
3. Review data in the maintenance manuals.
4. Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION

SECTION 08 41 13

ALUMINUM ENTRANCES AND WINDOW WALL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Aluminum doors and window wall frames.

B. Related Sections:
1. Section 08 45 43 - Translucent Wall Systems
2. Section 08 51 13 - Aluminum Windows.
3. Section 08 71 00 - Door Hardware
4. Section 08 80 00 - Glazing.

1.02 SYSTEM DESCRIPTION

A. Design Requirements:
1. Window wall framing system shall provide for flush retained glazing on all sides without projecting stops with off-center glazing as detailed on Drawings.
2. Framing system shall be suitable for outside or inside glazing.
3. System shall be either screw spline, shear block or a compensating/stick system, as applicable.

B. Test Procedures and Performance (Exterior window wall):
1. Air Infiltration Test
a. Test unit in accordance with ASTM E 283 at a static air pressure difference of 6.24 psf (299 Pa).
b. Air infiltration shall not exceed .06 cfm/SF (.30 l/s•m²) of unit.
2. Water Resistance Test
a. Test unit in accordance with ASTM E 331.
b. There shall be no uncontrolled water leakage at a static test pressure of 12.0 psf (718 Pa).
3. Uniform Load Deflection Test
a. Test in accordance with ASTM E 330.
b. Deflection under design load shall not exceed L/175 of the clear span.
4. Uniform Load Structural Test
a. Test in accordance with ASTM E 330 at a pressure 1.5 times the design wind pressure in 1.05.B.3.b.
b. At conclusion of the test, there shall be no glass breakage, permanent damage to fasteners, storefront parts, or any other damage that would cause the storefront to be defective.
5. Condensation Resistance Test (CRF)
a. Test unit in accordance with ASTM 1503.1.
b. Condensation Resistance Factor (CRF) shall not be less than 68 (frame) and 71 (glass) when glazed with 1" (25 mm) insulated – 1/4" (6 mm) clear low emissivity, 1/2" (12 mm) air, 1/4" (6 mm) clear glass.
6. Thermal Transmittance Test (Conductive U-Value)
a. Test in accordance with ASTM 1503.1.
b. Conductive thermal transmittance (U-Value) shall not be more than 0.50 BTU/hr•ft²•°F (2.83 W/m²•K) when glazed with 1" (25 mm) insulated – 1/4" (6 mm) clear low emissivity, 1/2" (12 mm) air, 1/4" (6 mm) clear glass.

7. Thermal Transmittance Test (Conductive U-Value)
   a. Test in accordance with NFRC-102.
   b. Conductive thermal transmittance (U-Value) shall not be more than 0.46 BTU/hr•ft²•°F (2.61 W/m²•K) when glazed with 1" (25 mm) insulated – 1/4" (6 mm) clear low emissivity, 1/2" (12 mm) air, 1/4" (6 mm) clear glass.

C. Performance - Aluminum Doors (Swinging): Resistance to corner racking shall be tested by the Dual Moment Load test as follows:
   1. Test section shall consist of standard top door corner assembly. Side rail section shall be 24 inches (600mm) long and top rail section 12 inches long.
   2. Anchor "top rail" positively to test bench so that corner protrudes 3 inches beyond bench edge.
   3. Anchor a lever arm positively to side rail at a point 19 inches from inside edge of top rail. Attach weight support pad at a point 19 inches from inner edge of side rail.
   4. Test section shall withstand a minimum load of 200 pounds on the lever arm before reaching the point of failure, which shall be considered a rotation on the lever arm in excess of 45 degrees.

1.03 SUBMITTALS

A. Submit product data, shop drawings and samples in accordance with Section 01 33 00.
   1. Product Data: Submit 2 copies of Manufacturer's Specifications, recommendations and standard details for aluminum doors, frames and components of the Work. Include manufacturer's installation manual.
   2. Shop Drawings:
      a. Include wall elevations at 1/2 inch scale, and full-size detailed sections of every typical composite member.
      b. Show anchors, joint system, expansion provisions, end dams, water diverters and other components not included in Manufacturer's standard data.
      c. Include glazing details.
   3. Samples:
      a. Submit 3 samples of each required aluminum finish on 12 inch long extrusions or 6 inch square sheets of the alloys to be used for the Work.
      b. Where normal color and texture variations are to be expected, include 2 or more units in each Sample, to show the range of such variations.
      c. Samples will be reviewed by Architect and Resident Engineer for color and texture only.
      d. Architect and Resident Engineer reserves the right to require samples of typical fabricated sections, showing joints, exposed fastenings (if any), quality of workmanship, hardware and accessory items, before fabrication of the Work proceeds.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.04 QUALITY ASSURANCE

A. Standards: Except as otherwise indicated, the requirements for aluminum doors and frames, and the terminology used in this Section, are those of NAAMM, AAMA and AA and in particular, those of the "Entrance Manual" by NAAMM.

B. Regulatory Requirements:
1. ANSI A117.1, 1998 "Accessible and Usable Buildings and Facilities."
2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
3. ADA Accessibility Guidelines (ADAAG).

C. Single Source Responsibility: Obtain entrances, window wall and operable windows, including finishes, used for this project through one source from a single manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

1.06 PROJECT/SITE CONDITIONS

A. Field Measurements:
1. Whenever possible, check the actual openings in the construction Work by accurate field measurement before fabrication, and show recorded measurements on final shop drawings.
2. Coordinate fabrication schedule with construction progress as directed and avoid delays of the Work.
3. Where necessary, proceed with fabrication without field measurement, and coordinate installation tolerances to ensure proper fit of units.

1.07 WARRANTY

A. Warrant entire system of aluminum entrance doors and frames against leaks or other defects for a period of ten (10) years in accordance with manufacturer's standard warranty as follows:
1. Defective materials and workmanship are hereby defined to include, but are not limited to, evidence of:
a. Penetration of water into the building through fixed glazing and framing components.
b. Air infiltration exceeding specified limits.
c. Structural failure of components resulting from forces within specified limits.
d. Failure of insulated glass units.
e. Cracking, crazing, flaking, of coatings or opacifiers on glass.
f. Secondary glass damage and/or damage due to falling components.
g. Adhesive or cohesive failure of sealant.
h. Crazing on surface of non-structural sealant.
i. Non-structural sealant hardening beyond Shore A durometer 50 or softening below 20.
j. Failure of operating parts to function normally.

B. Warrant aluminum finish against excessive fading, excessive non- uniformity of color or shade, cracking, peeling, pitting or corroding (all within the limits defined). Warranty shall include replacement at no charge (material and labor) for a period of five (5) years beginning on the date of final acceptance.

C. Upon notification of defects within the warranty period, make the necessary repairs and replacements at the convenience of the Owner. Repairs and replacements shall include resultant damage to adjacent materials, systems and equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following manufacturers subject to compliance with specifications requirements:
1. EFCO www.efcocorp.com (Basis of Design)
2. Arcadia, Inc. www.arcadiainc.com
3. Kawneer Co. www.kawneer.com
4. United States Aluminum Corp. www.usalum.com
5. Vistawall Architectural Products. www.vistawall.com
6. Or equal.

2.02 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Framing members, transition members, mullions, adapters, and mountings: Extruded 6063 T6 aluminum alloy and temper.

C. Screws, miscellaneous fastening devices, and internal components: Aluminum, stainless steel, or zinc plated steel in accordance with ASTM B633. Perimeter (exposed) anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum.

D. Dissimilar Metals: Properly insulated to prevent galvanic action.

E. Thermal Barrier: Barrier material shall be poured in place, two-part polyurethane. A nonstructural thermal barrier is unacceptable.

F. Glazing gaskets: Elastomeric extrusions as required to provide specified performance. PVC glazing gaskets are not acceptable.

F. Steel Sections: ANSI/ASTM A36; shaped to suit mullion sections.

H. Shop and Touch-Up Primer for Steel Components: SSPC 15, Type 1, red oxide.

I. Touch-Up Primer for Galvanized Steel Surfaces: SSPS 20, zinc rich type.

J. Glass: As specified in Section 08 80 00.

K. Sealant:
1. Silicone sealant in accordance with Section 07 92 00.
2. Interior Applications: In accordance with the low-emitting materials requirements of Section 01 60 00 – Product Requirements.

2.03 COMPONENTS

A. Sizes and Profiles: The required sizes for doors and frame units, and profile requirements, are shown.
1. Exterior windowwall: Series 406 as manufactured by EFCO or equal, 2 inches by 6-1/2 inch thermal storefront framing. Framework shall accept translucent wall systems specified in Section 08 45 43 and aluminum windows (operable) specified in Section 08 51 13.
2. Interior windowwall: Series 402 as manufactured by EFCO or equal, 2 inches by 4-1/2 inch thermal storefront framing.

2.04 FABRICATION

A. General:
1. Weld by methods recommended by the Manufacturer and AWS to avoid discoloration at welds.
2. Grind exposed welds smooth and restore mechanical finish.
3. Remove arises from cut edges and ease edges and corners to a radius of approximately 1/64 inch.
4. Conceal fasteners, wherever possible, except as otherwise shown.
5. Maintain continuity of line and accurate relation of planes and angles.
6. Provide secure attachment and support at mechanical joints, with hairline fit of contacting members.
7. Reinforce the Work as necessary for performance requirements, and for support to the structure.
8. Separate dissimilar metals with bituminous paint or preformed separators which will prevent corrosion.
9. Separate metal surfaces at moving joints with non-metallic separators to prevent "freeze-up" of joints.

B. Frames:
1. Fabricate tubular assemblies as shown, with either welded or mechanical joints in accordance with Manufacturer's standards, with concealed fasteners wherever possible.
a. Extrusions: Minimum wall thickness of 0.080 inches.
b. Exposed work: Carefully matched to produce continuity of line and design with all joints. System design shall be such that raw edges shall not be visible at joints.
c. Components:
1) Frames (Typical): Screw spline construction.
2. Door Frames: Shear blocked horizontals between the door jambs with screw spline sidelites.
d. Glazing: Dry glazed with recyclable EPDM gasket on both exterior and interiors.
2. Provide members of the size, shape, and profile shown.
3. Reinforce internally with steel channel shapes as shown, or as necessary to support the required loads. Secure vertical steel at head and sill as necessary for structural performance.
4. Weatherstripping: Provide compression weatherstripping on door-contact face of door stops on exterior door frames and/or other frames where indicated.

5. Glass framing members shall provide for flush glazing with through sight lines, without projecting stops for glass thicknesses noted on drawings or as specified in Section 08 80 00.
6. Provide glazing system for frames to receive lights. Design system for replacement of glass.
7. System shall provide resilient settings for glass by use of elastomeric extrusions as required to provide specified performance. PVC glazing gaskets are not acceptable.
8. Fabricate frame assemblies for exterior walls with flashing and weeps to drain penetrating moisture to exterior.
9. Provide anchorage and alignment brackets for concealed support of assembly from the building structure.
10. Exterior window wall framing systems shall be designed to provide for thermal movement of all component materials resulting from surface temperatures as applicable to location of project (180 degree F range) without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or other detrimental effects. Operating windows and doors shall function normally over this temperature range.
11. Include flashings in conjunction with components as detailed, finished to match.

C. Doors (Swinging)
1. Materials: Sections shall be extruded for 6063-T5 aluminum alloy (ASTM B221 - Alloy G.S. 10A T5).
2. Fasteners, where exposed, shall be aluminum, stainless steel or plated steel in accordance with ASTM A-164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum.
3. Glazing gaskets shall be TPE or EPDM elastomeric extrusions.
4. Major portions of the door stiles shall be 0.125 inch in thickness and glazing molding shall be 0.050 inch thick.
5. Construction:
   a. Stiles (vertical, top rail and bottom rail): Dimensions in accordance with door elevations on Drawings.
   b. Thickness of stiles and rails: 1-3/4 inches.
   c. Corner construction: Fillet weld and mechanical clip fastening.
6. Door shall be weatherstripped on 3 sides with metal-backed pile cloth installed in door and/or frame. Provide an integral adjustable (uninterrupted) dual weathering at meeting stiles of pairs of doors.
7. Hardware: Provide the following items:
   a. Hinges, push-pulls, locks, closers, threshold, weatherstrip, and door bottom/sweep: Aluminum Door Manufacturer's standard.
   b. Cylinder: As specified in Section 08 71 00.

D. Flashings and Miscellaneous Trim:
1. Provide interior sills, exterior sill (or subsills) with end dams, closures, flashings, trim and other elements in conjunction with or adjacent to framing system as required for watertightness and aesthetics. If sill frame does not provide means for conducting water out of the aluminum frame systems, then suitable flashings to ensure that water is conducted out of system shall be provided. Provide water diverters at ends of the horizontal mullion glazing pockets to drain water down the vertical mullion/hamb glazing pockets to sill can or flashing.
2. Fabricate miscellaneous trim from 0.060-inch-thick minimum aluminum (break metal) finished to match other components, except fabricate interior and exterior sills(or subsills) from 0.075-inch-thick minimum extruded aluminum (unless the sill or subsill is supporting the weight of the system and then a 0.125-inch thick minimum extruded aluminum shall be provided).

3. Flashings and sill can, in conjunction with mechanically fastened end dams and/or water diverters shall direct water entering the system to the outside of the building and shall not depend solely upon sealants.

E. Hardware Installation at Factory:
1. Cut, reinforce, drill and tap frames as required to receive hardware except do not drill and tap for surface-mounted items until the time of installation at the Project Site. Comply with Hardware Manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
2. Install hardware, except surface-mounted hardware, at fabrication plant. Remove only as required for final finishing operations, and for delivery and installation of the Work at the Project Site.

F. Aluminum Finishes:
1. Prepare the aluminum surfaces for finishing in accordance with the aluminum producer's recommendations and standards of the finisher or processor.
2. Process components of each assembly in a manner to attain complete uniformity of color.
3. Finish: Black anodized, Architectural Class I anodic coating conforming to Aluminum Association Designation AA-M-12 C22 A44.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Comply with Manufacturer's Specifications and recommendations for the installation of aluminum entrance and frames.
1. Furnish necessary material, labor, and equipment for the complete installation of the following: glass framing, vertical and horizontal mullions, transitional members connecting these components, adapters and mountings for trim moldings and facing materials.
2. Set units plumb, level and true in line, without warp or rack of frames, doors or panels.
3. Anchor securely in place.
4. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
5. Set sill members and other members in a bed of compound as shown, or with joint fillers or gaskets as shown to provide weathertight construction.

B. Comply with Section 07 92 00 for sealants, compounds, fillers and gaskets to be installed integrally with aluminum entrances.
1. Seal joints in aluminum entrance and framing in a concealed manner, unless exposed sealant is indicated.

C. Comply with Section 08 80 00 and Aluminum Entrance Manufacturers printed instructions for installation of glass shown to be glazed into aluminum entrances.

D. Dimensions indicated are based on an assumed design temperature of 70 degrees F. Take into account the ambient temperature range at the time of fabrication and erection.

E. Cut and trim component parts of the aluminum entrance and frames during erection only with the approval of the manufacturer or fabricator and in accordance with his recommendations. Do not cut through reinforcing members. Restore finish completely to protect material and remove evidence of cutting and trimming. Remove and replace members where cutting or trimming has impaired strength or appearance.

F. Do not erect members which are warped, bowed, deformed or otherwise damaged to such extent as to impair strength or appearance. Remove and replace members damaged in the process of erection.

3.03 FIELD QUALITY CONTROL

A. At Owner's request, test the entrance and framing system for water leaks in accordance with AAMA 501.2.94.

3.04 CLEANING

A. Clean aluminum surfaces promptly after installation of frames, exercising care to avoid damage of the protective coating.

B. Remove excess glazing and sealant compounds, dirt, and other substances.

C. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 08 45 43

TRANSLUCENT WALL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes aluminum framed, Insulated, translucent panel wall system.

B. Related Sections:
1. Section 08 41 13 – Aluminum Entrances and Storefronts.
2. Section 08 51 13.13 – Aluminum Windows.

1.02 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide the manufacturer's stock system, adapted to the application indicated, that complies with performance requirements specified as demonstrated by testing the manufacturers corresponding stock systems according to test methods indicated.

B. Air and Water Infiltration: Design and install the wall system for permanent resistance to air and water leakage through the system.

C. Structural Performance: Design, engineer, fabricate, and install the wall system to withstand the effects of a 20 psf wind load with no material failures or permanent deformation of structural members.
1. Structural test pressure equal to 150 percent of the inward and outward acting design wind pressures.
2. Deflections: Capable of withstanding building movements including wind loading and performing within the following limitations:
   a. Deflection of framing members shall not exceed 1/60 of its clear span or 3/4 inch, whichever is less.

D. Thermal Movements: Aluminum wall system capable of withstanding thermal movements resulting from an ambient temperature differential of 120 deg F, which may result in a metal surface temperature range of 180 deg F within the aluminum framing without causing buckling, stresses on glazing, failure of joint sealants, damaging loads on fasteners, or other detrimental effects.

1.03 SUBMITTALS

A. Product data: Include manufacturer's specifications for materials and fabrication, installation instructions, and recommendations for maintenance. Include current I.C.C. test reports showing compliance with project requirements.

B. Shop Drawings: Include typical unit elevations at 1/2-inch scale and details at 3-inch scale. Show dimensions, profiles of members, anchorage system, interface with building construction, and glazing.

C. Test Reports: Provide test reports from a qualified independent testing laboratory that show compliance of aluminum wall system with performance requirements indicated based on comprehensive testing of the system by the laboratory.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.04 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide glazed aluminum wall system for the project from one source from a single manufacturer.

1.05 PROJECT CONDITIONS

A. Field Measurements: Take field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1.06 SEQUENCING AND SCHEDULING

A. Schedule installation of the glazed aluminum wall system in sequence with related elements of the Work specified in other Sections to ensure that assemblies, including flashing, trim, and joint sealers, are protected against damage from effects of weather, age, corrosion, and other causes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of Kalwall System by Kalwall Corp. (800) 258-9777 or equal, subject to compliance with specifications requirements:

2.02 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Aluminum: Provide alloy, temper, and thickness recommended by the manufacturer for the type of use and finish indicated and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.
1. Extruded Bar and Shapes: Comply with requirements of ASTM B 221.
2. Plate and Sheet: Comply with requirements of ASTM B 209.

C. Translucent Panels: 2-3/4" thick insulated sandwich panels consisting of glass fiber reinforced polymer faces bonded to a mechanically interlocked 12” x 24” aluminum grid core.
1. Color stability: Change not more than 3.0 units (delta E per ASTM D 2244) determined by an average of three white samples after 60 months outdoor exposure.
2. Exterior face impact resistance: 60 ft. lbs.
3. Fire performance characteristics: Maximum flame spread of 45, smoke developed 350, when tested in accordance with ASTM E 84, Class A rating.
4. Laminate adhesive: I.C.B.O. approved; 750 psi tensile strength per ASTM C 297; 500 psi shear strength per ASTM D 1002.

D. Technical Summary:
   1. Exterior color: Rose.
   2. Interior color: White.
   3. Percent Light Transmission
      a. Translucent panel: 0.18 U: 4%
      b. Glass Window: 70%
   4. Wall Solar Heat Gain Coefficient @35 degree angle: 0.10 SHGC
   5. Integral dual glazed operable windows by translucent manufacturer.

E. Glazing Accessories: Manufacturer's standard glazing system of resilient elastomeric glazing tapes, setting blocks and shims or spacers as required, hardness as selected by manufacturer.

F. Sealants and Joint Fillers: Comply with requirements specified in Section 07 92 00 for silicone sealants.

G. Flashing: Aluminum, minimum 0.60" thick, finished to match aluminum framing.

H. Fasteners and Accessories: Provide manufacturer's standard non-corrosive fasteners and accessories compatible with materials used in the framing system and with exposed portions that match finish of the wall system. Where movement is expected, provide slip-joint linings of sheets, pads, shims, or washers of fluorocarbon resin or a similar material recommended by the manufacturer.
   1. Where fasteners anchor into aluminum less than 0.125-inch thick, provide noncorrosive pressed-in splined grommet nuts or other type reinforcement to receive fastener threads.

2.03 FABRICATION

A. General: Fabricate wall system at the manufacturer's shop to the fullest extent possible.
   1. Match exposed work to produce continuity of line. Fit joints accurately and secure rigidly.
   2. Window panels shall be a true sandwich panel of flat fiberglass sheet bonded to a grid core of mechanically interlocking aluminum I-beams and shall be resin laminated under controlled heat and pressure. Tape bond systems are not allowed.
   3. Grid Pattern: As indicated on Drawings.
   4. Weep Holes:
      a. Sill Components: Weep holes located as required to control condensation that may enter system by allowing it to pass to exterior.
      b. Baffles: Weep holes baffled to prevent water infiltration due to unequal pressures.
   5. Perimeter Framing: Two-piece, snap and capture channel.

B. Engineering/Calculations: Manufacturer shall produce calculations for windload by California licensed engineer for coordination of maximum deflection and reactions forces at head and sill

2.04 FINISHES

A. Aluminum Finishes:
1. Prepare the aluminum surfaces for finishing in accordance with the aluminum producer's recommendations and standards of the finisher or processor.
2. Process components of each assembly in a manner to attain complete uniformity of color.
3. Finish: Factory finished Kynar, custom color (2605 AMMA), 10 year manufacturer's standard warranty.

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's instructions for protecting, handling, and installing fabricated wall components, with particular care and attention to preservation of applied finishes. Discard or remove and replace damaged members.

B. Anchor components securely in place in the manner indicated. Shim and allow for movement resulting from changes in thermal conditions. Provide separators and isolators to prevent corrosion, electrolytic deterioration, and freeze-up of moving joints.

C. Sealants and joint fillers: Install at junctures with other work. Comply with requirements specified in Section 07 92 00. Set sill and curb members in a full bed of sealant compound, or with joint fillers or gaskets to provide weaterh-gith construction

D. Install flashing and sealants where indicated and where required at interface of wall work with other construction to provide a weather-tight installation.

3.02 FIELD QUALITY CONTROL

A. Water Test: Test walls according to procedures in AAMA 501.2.

B. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

3.03 CLEANING

A. Clean aluminum surfaces promptly after installation of frames, exercising care to avoid damage of the protective coating.

B. Remove excess glazing and sealant compounds, dirt, and other substances.

C. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 08 51 13.13

ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Aluminum operable (casement and awning) windows.

B. Related Sections:
1. Section 08 45 43 - Translucent Wall Systems
2. Section 08 41 13 - Aluminum Entrances and Window Wall.
3. Section 08 71 00 - Door Hardware
4. Section 08 80 00 - Glazing.

1.02 SYSTEM DESCRIPTION

A. Performance Requirements: Windows shall be certified to meet ANSI/AAMA specified performance for structural, water resistance and air infiltration.

B. Test Procedures and Performances
1. Casement Windows shall conform to all AAMA/WDMA/CSA 101/I.S.2/A440 – 08 requirements.
2. Awning (Projected) Windows shall conform to all ANSI/AAMA/NWWDA 101/I.S.2/NAFS-02 requirements.
3. Life Cycle Testing: Test in accordance with AAMA 910. There shall be no damage to fasteners, hardware parts, support arms, activating mechanisms, or any other damage that would cause the window to be inoperable. Air infiltration and water resistance tests shall not exceed specified requirements.
4. Air Infiltration Test
   a. With ventilators closed and locked, test unit in accordance with ASTM E 283 at a static air pressure difference of 6.24 psf (299 Pa).
   b. Air infiltration shall not exceed .10 cfm/SF (.50 l/s•m²) of unit.
5. Water Resistance Test
   a. With ventilators closed and locked, test unit in accordance with ASTM E 331/ASTM E 547 at a static air pressure difference of 15.0 psf (718 Pa).
   b. There shall be no uncontrolled water leakage.
6. Uniform Load Deflection Test
   a. Casement Windows: With ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 110.0 psf (5266 Pa), positive and negative pressure.
   b. Awning (Projected) Windows: With ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 65.0 psf (3112 Pa), positive and negative pressure.
   c. No member shall deflect over L/175 of its span.
7. Uniform Load Structural Test
   a. Casement Windows: With ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 165.0 psf (7900), both positive and negative.
   b. Awning (Projected) Windows: With ventilators closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 97.5 psf (4668 Pa), both positive and negative.

c. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, nor any other damage that would cause the window to be inoperable.

8. Forced Entry Resistance
   a. Casement Windows: Windows shall be tested in accordance to ASTM F 588 or AAMA 1302.5 and meet the requirements of performance level. 40.
   b. Awning (Projected) Windows: Windows shall be tested in accordance to ASTM F 588 or AAMA 1302.5 and meet the requirements of performance level 10.
9. Condensation Resistance Test (CRF)
   a. Test unit in accordance with AAMA 1503.1.
   b. Condensation Resistance Factor (CRF) shall not be less than 43.
10. Condensation Resistance (CR)
   a. With ventilators closed and locked, test unit in accordance with NFRC 500-2010.
   b. Condensation Resistance (CR) shall not be less than 32.
11. Thermal Transmittance Test (Conductive U-Factor)
   a. With ventilators closed and locked, test unit in accordance with NFRC 100-2010.
   b. Conductive thermal transmittance (U-Factor) shall not be more than 0.64 BTU/hr•ft^2•°F.

1.02 SUBMITTALS

A. Product Data: Submit Manufacturer's Specifications and performance data.

B. Shop Drawings: Submit Drawings showing elevations of each frame type, details, locations, size and thickness of materials, joints and connections, and installation requirements.

C. Samples: Submit 2 samples of aluminum finish for approval.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Standards:
   1. ANSI/AAMA 101, "Voluntary Specifications for Aluminum Prime Windows and Sliding Glass Doors."
   2. ANSI/AAMA 904.1, "Friction Hinges."
   3. ASTM E405, "Wear Testing Rotary Operators for Windows."

B. Single Source Responsibility: Obtain entrances, window wall and operable windows, including finishes, used for this project through one source from a single manufacturer.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

PART 2 PRODUCTS

2.01 MATERIALS, COMPONENTS AND ACCESSORIES – GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

2.02 MANUFACTURERS AND PRODUCTS

A. General: Furnish products of EFCO, Monett, MO or equal, subject to compliance with specifications requirements.

B. Thermal Windows:
1. Casement Windows: Series 2700 Thermal windows as manufactured by EFCO or equal, AW-PG110-C Grade.
2. Awning (Projected) Windows: Series 2700 Thermal windows as manufactured by EFCO or equal, AP-AW65 Grade.

2.03 MATERIALS

A. Aluminum: Extrusions shall be 6063-T5 alloy and temper meeting ASTM B221 alloy G.S. 10A-T5.

B. Fasteners: Where exposed shall be aluminum, stainless steel or zinc plated steel in accordance with ASTM A633. Perimeter (exposed) anchors shall be aluminum or steel, providing the steel is properly insulated from the aluminum.

C. Aluminum Finishes:
1. Prepare the aluminum surfaces for finishing in accordance with the aluminum producer's recommendations and standards of the finisher or processor.
2. Process components of each assembly in a manner to attain complete uniformity of color.
3. Finish: Black anodized, Architectural Class I anodic coating conforming to Aluminum Association Designation AA-M-12 C22 A44.

D. Hardware:
1. Weatherstripping: Santoprene® or equal.
2. Locking handles shall be cam type and manufactured from a white bronze alloy with a US25D brushed finish.
3. Operating Hardware: Concealed 4-bar, stainless steel arms.

E. Thermal Barrier
1. Exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.

2. The perimeter frame thermal barrier shall be thermal struts, consisting of glass reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions.
3. The sash and intermediate rails shall be poured and debridged thermal barrier made of two-part polyurethane.

F. Screens (where shown on Drawings): Manufacturer's standard at operable units. Match window finish.

G. Glazing: As specified in Section 08 80 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Install windows level, plumb, square, in alignment with adjacent Work, and in strict accordance with Manufacturer's printed instructions Securely anchor in place with fasteners of sufficient strength to properly hold the windows rigidly in place.

B. Joints between metal window frames and masonry or stucco shall be tightly calked in order to ensure a watertight installation. Installation of windows into exterior insulation finish systems (EIFS) shall be carefully coordinated with EIFS installer to ensure a watertight installation

C. Back paint aluminum sections with asphaltic paint where in contact with corrosive materials.

D. Adjust hardware for proper operation.

E. After installation, adequately protect exposed portions of window framing from damage by plaster lime, acid, paint or other harmful agents or elements.

3.03 CLEANING

A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Clean metal surfaces after installation with plain water or water with soap or household detergent. No abrasive cleaning agents shall be used.

C. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 08 65 00

TUBULAR SKYLIGHTS

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Completed tubular daylighting device assemblies shall be capable of meeting the following performance requirements:
   1. Air Infiltration Test: Air infiltration will not exceed 0.30 cfm/sf aperture with a pressure delta of 1.57 psf across the tube when tested in accordance with ASTM E 283.
   2. Water Resistance Test: No uncontrolled water leakage at 10.5 psf pressure differential with water rate of 5 gallons/hour/sf when tested in accordance with ASTM E 547.
   3. Uniform Load Test:
      a. No breakage, permanent damage to fasteners, hardware parts, or damage to make daylighting system inoperable or cause excessive permanent deflection of any section when tested at a Positive Load of 150 psf (7.18 kPa) or Negative Load of 70 psf (3.35 kPa).
      b. All units shall be tested with a safety factor of (3) for positive pressure and (2) for negative pressure, acting normal to plane of roof in accordance with ASTM E 330.
   4. Fire Testing:
      a. When used with the Dome Edge Protection Band, all domes meet fire rating requirements as described in the 2006 International Building Code.
      b. Self-Ignition Temperature - Greater than 650 degrees F Per: U.B.C. Standard 26-6. See ASTM D-1929.
      c. Smoke Density - Rating no greater than 450 Per U.B.C. 8-1 (See ASTM Standard E 84) in way intended for use. Classification C.
      d. Rate of Burn and/or Extent - Maximum Burning Rate: 2.5 inches/min (62 mm/min) Classification CC-2: U.B.C. Standard 26-7. See ASTM D 635.
      e. Rate of Burn and/or Extent - Maximum Burn Extent: 1 inch (25 mm) Classification CC-1: U.B.C. Standard 26-7. See ASTM D 635.

1.02 SUBMITTALS

A. 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.

B. Shop Drawings. Submit shop drawings showing layout, profiles and product components, including anchorage, flashings and accessories.

C. Verification Samples: As requested by Architect and Resident Engineer.

D. Test Reports: Independent testing agency or evaluation service reports verifying compliance with specified performance requirements.

E. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engaged in manufacture of tubular daylighting devices for minimum 2 years.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.05 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.06 WARRANTY

A. Daylighting Device: Manufacturer's standard warranty for 10 years.

B. Electrical Parts: Manufacturer's standard warranty for 5 years, unless otherwise indicated.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS AND PRODUCTS

A. Acceptable Manufacturer: Solatube International, Inc.; 2210 Oak Ridge Way, Vista, CA 92083, (888) 765-2882. www.solatube.com or equal.

2.02 MATERIALS, COMPONENTS AND ACCESSORIES – GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

2.03 TUBULAR DAYLIGHTING DEVICES

A. Tubular Daylighting Devices General : Transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly, transferring sunlight to interior spaces; complying with ICBO/ICC AC-16.

B. Tubular Skylight – 21 inch diameter (SolaMaster Series): Solatube Model 750 DS-C, 21 inch (530 mm) Daylighting System or equal:

1. Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
   a. Outer Dome Glazing: Type DA, 0.125 inch (3.2 mm) minimum thickness injection molded acrylic classified as CC2 material; UV inhibited, impact modified acrylic blend.
   b. Inner Dome Glazing: Type DPI, 0.115 inch (3 mm) minimum thickness polycarbonate classified as CC1 material.
   c. Roof Flashing Turret Extensions: Provide manufacturer's standard extensions for applications as requiring for units adjacent to PV panels or parapets, Type T24, aditional lengths of 24 inches (600 mm) extension.
2. Raybender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.
3. Roof Flashing Base: One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube.
   a. Base Material: Sheet steel, corrosion resistant conforming to ASTM A 653/A 653M or ASTM A 463/A 463M, 0.028 inch (0.7 mm) thick.
   b. Base Style: Type F11, Self mounted, 11 inches (279 mm) high.
   c. Flashing Insulator: Type FI, Thermal isolation material for use under flashing.
4. Tube Ring: Attached to top of base section; 0.090 inch (2.3 mm) nominal thickness injection molded high impact PVC; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.
5. Dome Seal: Adhesive backed weatherstrip 0.63 inch (16 mm) tall by 0.28 inch (7 mm).
6. Reflective Tubes: Aluminum sheet, thickness 0.018 inch (0.5 mm).
   a. General:
      1) Interior Finish: Spectralight Infinity high reflectance specular finish on exposed reflective surface. Specular reflectance for visible spectrum (400 nm to 760 nm) greater than 99 percent. Total solar spectrum reflectance (400 nm to 2500 nm) less than 93 percent.
      2) Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.
   b. Top Tube Angle Adapter and Bottom Top Tube Angle Adapter Kit, Type AK:
      1) Reflective 30 degree adjustable top and bottom angle adapters (one each), 16 inches (406 mm) long
   c. Extension Tube:
      1) Reflective extension tube, Type EXX, Notched for Open Ceiling diffuser attachment, 24 inches (610 mm) long
7. Diffuser Assemblies: Gypsum Board and Suspended Ceiling Tile ceilings: Solatube Model 750 DS-C. Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom termination of tube; 23.8 inches by 23.8 inches (605 mm by 605 mm) square frame to fit standard suspended ceiling grids or hard ceilings.
   a. Round to square transition box made of opaque polymeric material, classified as CC2, Class C, 0.110 inch (2.8 mm) thick.
   b. Lens: Type L1 Optiview lens design to maximize light output and diffusion with extruded aluminum frame and EPDM foam seal to minimize condensation and bug, dirt and air infiltration per ASTM E 283. Visible Light Transmission shall be greater than 90 percent at 0.100 inches (2.5 mm) thick. Classified as CC2.

8. Local Dimmer Control utilizing a butterfly baffle design of Spectralight Infinity reflective material to minimize shadowing when in use: Provided with dimmer switch and cable.
   a. Daylight Dimmer: Type D Electro-mechanically actuated daylight valve; for universal input voltages ranging between 90 and 277 V at 50 or 60 Hz; maximum current draw of 50 ma per unit; controlled by low voltage, series Type T02: circuited, 4 conductor, size 22 cable; providing daylight output between 2 and 100 percent. Provided with dimmer switch and cable.
   b. Switch: Type SW, Manufacturer-specific low voltage DC DP/DT switch (white) required to operate Daylight Dimmer. Note: only one switch is required per set of synchronously controlled dimmers.
   c. Cable: Type CA, Two conductor low voltage cable (500 foot) for multiple unit DC connection.
9. Provide other components/accessories as required for a complete installation.

C. Tubular Skylight – 14 inch diameter (Brighten Up Series): Solatube Model 290 DS: 14 Inch (350 mm) Daylighting System:
1. Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
   a. Outer Dome Glazing: Type DA, 0.125 inch (3.25 mm) minimum thickness impact resistant injection molded acrylic classified as CC2 material; UV inhibiting, impact modified acrylic blend.
   b. Raybender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.
   c. LightTracker Reflector: Aluminum sheet, thickness 0.015 inch (0.4 mm) with Spectralight Infinity. Positioned in dome to capture low angle sunlight.
2. Flashing Base: As applicable for installation to metal roofing.
   a. One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube.
   b. Base Material: Sheet steel, corrosion resistant, meeting ASTM A 653/A 653M or ASTM A 463/A 463M, 0.028 inch (0.7 mm) thick.
3. Tube Ring: Attached to top of base section; 0.090 inch (2.3 mm) nominal thickness injection molded high impact acrylic; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.
4. Reflective Extension Tube: Aluminum sheet, thickness 0.015 inch (0.4 mm).
   a. Interior Finish: Spectralight Infinity high reflectance specular finish on exposed reflective surface. Visible spectrum (400 nm to 760 nm) greater than 99 percent. Total solar spectrum (400 nm to 2500 nm) less than 93 percent.
   b. Color: a* and b* (defined by CIE L*a*b* color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance to ASTM E 308.
   c. Tube Diameter: Approximately 14 inches (356 mm).
5. Reflective 30 degree Adjustable tube: Aluminum sheet, thickness .015 inch (0.4 mm)
   a. Interior Finish: Spectralight Infinity high reflectance specular finish on exposed reflective surface. Visible spectrum (400 nm to 760 nm) greater than 99 percent. Total solar spectrum (400 nm to 2500 nm) less than 93 percent.
6. Ceiling Ring: Injection molded impact resistant acrylic. Nominal thickness is 0.110 inches (2.8 mm).

7. Dual Glazed Diffuser Assembly:
   a. Upper glazing: Acrylic plastic classified as CC2 material. The nominal thickness is 0.040 inches (1.020 mm).
   b. Lower glazing (L1 Optiview): Acrylic plastic classified as CC2 material. The nominal thickness is 0.090 inches (2.29 mm).
   c. Diffuser Trim Ring: Injection molded plastic, white trim (Vusion), L4.

2.04 ACCESSORIES

A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.

B. Suspension Wire: Steel, annealed, galvanized finish, size and type for application and ceiling system requirement.

C. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect and Resident Engineer of unsatisfactory preparation before proceeding.

3.02 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.

3.03 INSTALLATION

A. Install in accordance with manufacturer's printed instructions.

B. After installation of first unit, field test to determine adequacy of installation. Conduct water test in presence of Owner, Architect and Resident Engineer, or Contractor, or their designated representative. Correct if needed before proceeding with installation of subsequent units.

C. Electrical: Provide power and controls to dimmer in accordance with Division 26 requirements.

D. Construction Waste: In accordance with Section 01 74 19.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 087100

DOOR HARDWARE

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. Mechanical and electrified door hardware for:

   a. Swinging doors.
   b. Gates.

2. Electronic access control system components, including:

   a. Electronic access control devices.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section “Alternates” for alternates affecting this section.
2. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
3. Division 28 sections for coordination with other components of electronic access control system.

1.3 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

1.4 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.

B. Action Submittals:

1. Product Data: Product data including manufacturers’ technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

    a. Wiring Diagrams: For power, signal, and control wiring and including:
        1) Details of interface of electrified door hardware and building safety and security systems.
        2) Schematic diagram of systems that interface with electrified door hardware.
        3) Point-to-point wiring.
        4) Risers.

3. Samples for Verification: If requested by Architect and Resident Engineer, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.

    a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect and Resident Engineer may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

    a. Door Index; include door number, heading number, and Architect’s hardware set number.
    b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
    c. Type, style, function, size, and finish of each hardware item.

d. Name and manufacturer of each item.
e. Fastenings and other pertinent information.
f. Location of each hardware set cross-referenced to indications on Drawings.
g. Explanation of all abbreviations, symbols, and codes contained in schedule.
h. Mounting locations for hardware.
i. Door and frame sizes and materials.
j. Name and phone number for local manufacturer's representative for each product.
k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
    1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

5. Key Schedule **[AS DIRECTED BY SD CITY LOCKSHOP]**:

    a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
    b. Use ANSI/BHMA A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
        1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.

    f. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product Certificates for electrified door hardware, signed by manufacturer:

    a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Certificates of Compliance:

    a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect and Resident Engineer or Authority Having Jurisdiction.
    b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in “QUALITY ASSURANCE” article, herein.

c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in “QUALITY ASSURANCE” article, herein.

4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
5. Warranty: Manufacturer’s standard warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data : Provide in accordance with Division 01 and include:

a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Name, address, and phone number of local representative for each manufacturer.
d. Parts list for each product.
e. Final approved hardware schedule, edited to reflect conditions as-installed.
f. Final keying schedule
g. Copies of floor plans with keying nomenclature
h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.5 QUALITY ASSURANCE

A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.

1. Where specific manufacturer’s product is named and accompanied by “No Substitute,” including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)

a. Where no additional products or manufacturers are listed in product category, requirements for “No Substitute” govern product selection.

2. Where products indicate “acceptable manufacturers” or “acceptable manufacturers and products”, provide product from specified manufacturers, subject to compliance with specified requirements and “Single Source Responsibility” requirements stated herein.

B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect and Resident Engineer, and Contractor, at reasonable times during the Work for consultation.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and Resident Engineer and electrical engineers and provide installation and technical data to Architect and Resident Engineer and other related subcontractors.

    a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.

D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
2. Can provide installation and technical data to Architect and Resident Engineer and other related subcontractors.
3. Can inspect and verify components are in working order upon completion of installation.
4. Capable of producing wiring diagrams.
5. Capable of coordinating installation of electrified hardware with Architect and Resident Engineer and electrical engineers.

E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

H. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.

I. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).

2. Maximum opening-force requirements:

    a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
    b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
    c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.

J. Keying Conference **[COORDINATE WITH SD CITY LOCKSHOP]**: Conduct conference at Project site to comply with requirements in Division 01.

1. Attendees: Owner, Contractor, Architect and Resident Engineer, Installer,**[Owner's security consultant,]** and Supplier's Architectural Hardware Consultant.
2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

    a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    b. Preliminary key system schematic diagram.
    c. Requirements for key control system.
    d. Requirements for access control.
    e. Address for delivery of keys.

K. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Review required testing, inspecting, and certifying procedures.

L. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.

    a. Attendees: Door hardware supplier, door hardware installer, Contractor.
    b. After meeting, provide letter of compliance to Architect and Resident Engineer, indicating when meeting was held and who was in attendance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1. Deliver each article of hardware in manufacturer's original packaging.

C. Project Conditions:

1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:

1. Promptly replace products damaged during shipping.
2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

F. Deliver keys**[and permanent cores]** to Owner by registered mail or overnight package service.

1.7 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

F. Direct shipments not permitted, unless approved by Contractor.

1.8 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date of Substantial Completion, for durations indicated.

a. Closers:
1) Mechanical**:** 30 years for LCN 4000 and 15 years for LCN Concealed

b. Exit Devices:
1) Mechanical: 3 years.

c. Locksets:
1) Mechanical: 3 years.
2) Electrified: 1 year.

d. Key Blanks: Lifetime

2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”

1. Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers and/or products other than those listed as ”Scheduled Manufacturer ” or “Acceptable Manufacturers” in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

C. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

E. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect’s and Resident Engineer's approval.

2.2 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect and Resident Engineer if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.3 HINGES

A. Provide three-knuckle, concealed bearing hinges.

1. Manufacturers and Products:

a. Scheduled Manufacturer and Product: Ives 3CB series
b. Acceptable Manufacturers and Products: Stanley or equal.

B. Requirements:

1. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

2. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

3. 2 inches or thicker doors:

a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

4. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
5. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

a. Steel Hinges: Steel pins
b. Non-Ferrous Hinges: Stainless steel pins

c. Out-Swinging Exterior Doors: Non-removable pins
d. Out-Swinging Interior Lockable Doors: Non-removable pins
e. Interior Non-lockable Doors: Non-rising pins

7. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
8. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
10. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.
11. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

2.4 PIVOT SETS

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal
2. Acceptable Manufacturers: Stanley or equal

B. Requirements:

1. Provide pivot sets complete with oil-impregnated top pivot, unless indicated otherwise.
2. Where offset pivots are specified, Provide one intermediate pivot for doors less than 91 inches (2311 mm) high and one additional intermediate pivot per leaf for each additional 30 inches (762 mm) in height or fraction thereof. Intermediate pivots spaced equally not less than 25 inches (635 mm) or not more than 35 inches (889 mm) on center, for doors over 121 inches (3073 mm) high.
3. Provide appropriate model where pivot sets are scheduled at fire rated openings.
4. Provide lead-lined model where pivot sets are specified at lead-lined doors.
5. Provide pivots with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electrified pivot nearest to electrified locking component. If manufacturer of electrified locking component requires another device for power transfer then provide recommended power transfer device and appropriate quantity of pivots.
6. Provide mortar guard for each electric pivot specified, unless specified in hollow metal frame specification.

2.5 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal
2. Acceptable Manufacturers: DCI, Rockwood or equal

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.6 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal
2. Acceptable Manufacturers: DCI, Rockwood or equal

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

2.7 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Best 45H series or equal

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to “KEYING” article, herein.
2. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
4. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.
5. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

    a. Lever Design: Best 3R

2.8 EXIT DEVICES

A. Manufacturer and Product:

1. Scheduled Manufacturer: Von Duprin 98 series or equal
2. Acceptable Manufacturers and Products: No Substitute.

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4 and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Quiet Operation: Incorporate fluid damper or other device that eliminates noise of exit device operation.
4. Touchpad: Extend minimum of one half of door width, but not the full length of exit device rail. Provide end-cap with two-point attachment to door. Match exit device finish, stainless steel for US26, US26D, US28, US32, and US32D finishes; and for all other finishes, provide compatible finish to exit device. Provide compression springs in devices, latches, and outside trims or controls; tension springs prohibited.
5. Provide rim devices with a dual cylinder or inside thumb turn cylinder option with a visual security indicator that identifies the trims locked/unlocked status of the door from the inside of the room. Indicator in unlocked state presents a 1/2 inch x 1/2 inch white metal flag with black icon at top of device head. Indicator in locked state has no flag present. Provide rim devices without the dual cylinder or inside thumb turn cylinder option capable of being retrofitted with the visual security indicator.
6. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrical requirements.
7. Provide exit devices with manufacturer's approved strikes.
8. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect and Resident Engineer.
9. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
10. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.

    a. Lever Style: Match lever style of locksets.

11. Provide UL labeled fire exit hardware for fire rated openings.
12. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
13. Provide electrified options as scheduled in the hardware sets.

2.9 ELECTRONIC ACCESS CONTROL LOCKSETS

A. Manufacturers:

1. Scheduled Manufacturer: To establish standard of quality and design intent, electronic access control locksets and exit device trim specifications have been based on Schlage. Products of other manufacturers meeting or exceeding design and performance requirements specified herein will be considered for substitution subject to compliance with provisions of Division 01 Section “Product Requirements.”
2. Scheduled Manufacturer and Product: Schlage CO series or equal.

B. Product: Schlage **[CO-200-MS/MD]** standalone mortise-type electronic locksets.

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is field reversible for handing without opening case.
2. Backset: 2-3/4-inch (70 mm), nominal.
3. Latchbolt: 3-piece, beveled, stainless steel with 3/4-inch (19 mm) throw and anti-friction latch.
4. Deadbolt: Where deadbolt function is scheduled, provide stainless steel deadbolt interconnected with latch 1-5/8-inch (41 mm) high and 5/8-inch (16 mm) thick with 1-inch throw.
5. Chassis: ANSI/BHMA standard mortise lock prep for 1-3/4-inch (44 mm) doors

C. Requirements:

1. Provide offline electronic access control products that comply with the following requirements:

    a. Listed, UL 294 - The Standard of Safety for Access Control System Units.
    b. Compliant with ANSI/BHMA A156.25 Grade 1 Operation and Security.
    c. Certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAS 202 and TAS 203.
    d. Compliant with ASTM E330 for door assemblies.
    e. Compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada RSS-210.

2. Functions: Provide functions as scheduled that are field configurable without taking the offline electronic product off the door.
3. Emergency Override: Provide mechanical key override; cylinders: Refer to “KEYING” article, herein.
4. Levers:

    a. Vandal Resistance: Exterior (secure side) lever rotates freely while door remains locked, preventing damage to internal lock components from vandalism by excessive force.
    b. Provide non-handed lever trim that operates independently of non-locking levers.
    c. Style: Sparta

5. Power Supply: 4 AA batteries

    a. Provide electronic access control locks and/or exit device trim with the ability to communicate battery status.

6. Features:

    a. Visual tri-colored LED indicators that indicate activation, operational systems status, system error conditions and low power conditions.
    b. Visual bi-colored LED indicator on interior that is capable of indicating secured/unsecured status of device to occupants on interior.
    c. Audible feedback that can be enabled or disabled.
    d. Onboard processor with memory capacity of 2,000 users, 2,000 event audit history, up to 16 time zones and up to 32 calendar events.
    e. Tamper-Resistant Screws: Tamper torx screws on inside escutcheon for increased security.

7. Credential Reader:

    a. Credential Reader Configurations:
        1) Keypad.

    b. Credential Reader Capabilities: Provide credential readers capable of operating with the following integrated software partners.
        1) 12 button keypad with backlit buttons.

8. Operation:

    a. Provide electronic access control locks and/or exit device trim with the ability to be configured at door by handheld programming device the length of time device is unlocked upon access grant.
    b. Provide electronic access control locks and/or exit device trim with the ability to communicate identifying information such as firmware versions, hardware versions, serial numbers, and manufacturing dates by handheld programming device.

D. Components

1. Product: Schlage HHD series or equal with Utility Software.

    a. Provide Handheld Programming Device for adaptable electronic access control products capable of the following minimum requirements.
        1) Capable of initializing lock and accessories using preloaded software.
        2) Utilized to field configure electronic access control devices, to download firmware updates and door files to device, and to download audit files from device.

2.10 CYLINDERS **[EXISTING BEST KEY SYTEM, COORDINATE WITH SD CITY LOCKSHOP]**

A. Manufacturers:

1. Scheduled Manufacturer: Best or equal

B. Requirements:

1. Provide cylinders/cores, from the same manufacturer of locksets, compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer’s series as indicated. Refer to “KEYING” article, herein.

2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

    a. Conventional cylinder with Small Format Interchangeable Core (SFIC).
    b. Keying: Manufacturer-keyed permanent cylinders/cores, configured into keying system per "KEYING" article herein.
    c. Features: Cylinders/cores shall incorporate the following features.

3. Nickel silver bottom pins.
4. Project Cylinder/Core Distribution: Provide cylinders/cores complying with the following requirements in Project locations as indicated.
5. Replaceable Construction Cores.

    a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
        1) 12 construction change (day) keys.

    b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.11 KEYING **[EXISTING BEST KEY SYTEM, COORDINATE WITH SD CITY LOCKSHOP]**

A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.

    a. Keying system as directed by the Owner.

2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements shall be cause for replacement of cylinders/cores involved at no additional cost to Owner.
3. Provide keys with the following features.

    a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)

4. Identification:

    a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.
    b. Identification stamping provisions must be approved by the Architect and Resident Engineer.
    c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
    d. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.
    e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

5. Quantity: Furnish in the following quantities.

    a. Change (Day) Keys: 3 per cylinder/core.
    b. Permanent Control Keys: 3.
    c. Master Keys: 6.
    d. Unused balance of key blanks shall be furnished to Owner with the cut keys.
    e. Extra Keys:
        1) Presentation Keys (quantity as determined by Architect and Resident Engineer)
        2) Construction Keys (quantity as determined by Architect and Resident Engineer)

2.12 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 4040XP series or equal.

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 3/4 inch (19 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.13 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal.
2. Acceptable Manufacturers: Rockwood or equal.

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.

2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.14 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal.
2. Acceptable Manufacturers: Rockwood or equal.

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:

    a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
    b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
    c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.15 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson or equal.
2. Acceptable Manufacturers: Sargent or equal.

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.16 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal.
2. Acceptable Manufacturers: Rockwood or equal.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.17 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: NGP or equal.
2. Acceptable Manufacturers: Pemko, Zero International or equal.

B. Requirements:

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size of thresholds::

    a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
    b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width

3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.18 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal.
2. Acceptable Manufacturers: Rockwood or equal.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.19 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: LCN or equal.
2. Acceptable Manufacturers: Rixson, Sargent or equal.

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordination projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Wire magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.20 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer: Schlage or equal.
2. Acceptable Manufacturers: GE-Interlogix, Sargent or equal.

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.21 LATCH PROTECTORS

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal.
2. Acceptable Manufacturers: Rockwood or equal.

B. Provide latch protectors of type required to function with specified lock.

2.22 COAT HOOKS

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal.
2. Acceptable Manufacturers: Burns, Rockwood or equal.

B. Provide coat hooks as specified.

2.23 FINSHES

A. Finish: BHMA 626/652 (US26D); except:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Continuous Hinges: BHMA 630 (US32D)

3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

H. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches (750 mm) of door height greater than 90 inches (2286 mm).

I. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying section.
2. . **OPTION: Furnish permanent cores to Owner for installation.**

J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect and Resident Engineer.

L. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

Q. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.3 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant: Engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.7 DOOR HARDWARE SCHEDULE

A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

B. SpeXtra 136672; Hardware Sets:

Hardware Group 01 - Utility Closet Door (Single)

For use on door(s):

113 202 209 315

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PASSAGE LATCH	45H-0-N-3R	630	BES
1	EA	OH STOP & HOLDER	90F	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group 02 - Corridor Door (Passage Set)

For use on door(s):
104A 108

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PASSAGE LATCH	45H-0-N-3R	630	BES
1	EA	SURFACE CLOSER	4040XP SCUSH MC TBSRT	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	5050CL	CLR	NGP

Hardware Group 03 - Fire Rated Door (Passage Set)

For use on door(s):
106 114 118 119

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PASSAGE LATCH	45H-0-N-3R	630	BES
1	EA	SURFACE CLOSER	4040XP SCUSH MC TBSRT	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	5050CL	CLR	NGP
1	EA	THRESHOLD	613 MS/LA	AL	NGP

The threshold is required for the fire rating; however, if the flooring/sill is non-combustible, the threshold is not required.

Hardware Group 04 - Laundry/Lockers Door (Passage Set)

For use on door(s):
112

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PASSAGE LATCH	45H-0-N-3R	630	BES
1	EA	SURFACE CLOSER	4040XP HEDA MC TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	SET	SEALS	5050CL	CLR	NGP

Hardware Group 05 - Toilet Room Door (Privacy Set)

For use on door(s):
102 215

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PRIVACY W/INDICATOR	45H-0-L-3R-VIT	630	BES
1	EA	SURFACE CLOSER	4040XP SCUSH MC TBSRT	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	5050CL	CLR	NGP
1	EA	COAT AND HAT HOOK	572	673	IVE
1			MARBLE THRESHOLD BY OTHERS (IF REQUIRED)		

Hardware Group 06 - Toilet Room Door (Privacy Set)

For use on door(s):
110 206 308 309 317

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PRIVACY W/INDICATOR	45H-0-L-3R-VIT	630	BES
1	EA	SURFACE CLOSER	4040XP MC TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	SET	SEALS	5050CL	CLR	NGP
1	EA	COAT AND HAT HOOK	572	673	IVE
1			MARBLE THRESHOLD BY OTHERS (IF REQUIRED)		

Hardware Group 07 - Toilet Room Door (Privacy Set)

For use on door(s):
306

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PRIVACY W/INDICATOR	45H-0-L-3R-VIT	630	BES
1	EA	OH STOP & HOLDER	450F J	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	5050CL	CLR	NGP
1	EA	COAT AND HAT HOOK	572	673	IVE
1			MARBLE THRESHOLD BY OTHERS (IF REQUIRED)		

Hardware Group 08 - Toilet Room Door (Privacy Set)

For use on door(s):
311

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PRIVACY W/INDICATOR	45H-0-L-3R-VIT	630	BES
1	EA	OH STOP & HOLDER	450F	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	5050CL	CLR	NGP
1	EA	COAT AND HAT HOOK	572	673	IVE
1			MARBLE THRESHOLD BY OTHERS (IF REQUIRED)		

Hardware Group 09 - Dorm/Medic Room Door (Privacy Set)

For use on door(s):
204 208 312

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PRIVACY W/INDICATOR	45H-0-L-3R-VIT	630	BES
1	EA	OH STOP & HOLDER	90F	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	5050CL	CLR	NGP
1	SET	SEALS	700SA	CL	NGP
1	EA	DOOR BOTTOM	220NA	CL	NGP
1	EA	THRESHOLD	613 MS/LA	AL	NGP
1	EA	COAT AND HAT HOOK	572	673	IVE

Hardware Group 10 - Dorm Room Door (Privacy Set)

For use on door(s):
304 307 313 314 318 319 320

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	PRIVACY W/INDICATOR	45H-0-L-3R-VIT	630	BES
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS439	682	IVE
1	SET	SEALS	5050CL	CLR	NGP
1	SET	SEALS	700SA	CL	NGP
1	EA	DOOR BOTTOM	220NA	CL	NGP
1	EA	THRESHOLD	613 MS/LA	AL	NGP
1	EA	COAT AND HAT HOOK	572	673	IVE

Hardware Group 11 - Fire Riser Room Door

For use on door(s):
111

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW SH 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	45H-7-D-3R	630	BES
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	SURFACE CLOSER	4040XP SHCUSH MC TBSRT	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	DRIP CAP	16A	CL	NGP
1	EA	DOOR SWEEP	200SA	CL	NGP
1	EA	THRESHOLD	659 MS/LA	AL	NGP
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group 12 - Pole Enclosure Doors

For use on door(s):
201 217A

Qty		Description	Catalog Number	Finish	Mfr
2	EA	SPRING HINGE	3SP1 4.5 X 4.5	630	IVE
1	EA	ARMOR PLATE	8400 38" X 2" LDW	630	IVE

Hardware Group 13 - Stair Exit Door

For use on door(s):
105A 116A 205 216 305 316

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	EA	FIRE EXIT HARDWARE	AX-98-L-BE-F-03 SS-630	630/630	VON
1	EA	SURFACE CLOSER	4040XP SCUSH MC TBSRT	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	5050CL	CLR	NGP
1	EA	THRESHOLD	613 MS/LA	AL	NGP

The threshold is required for the fire rating; however, if the flooring/sill is non-combustible, the threshold is not required.

Hardware Group 14 - Building Entrance/Exit Door

For use on door(s):
105B 116B

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW SH 4.5 X 4.5 NRP	630	IVE
1	EA	ELEC CLASSROOM LOCK	CO-200-MS-70-KP-TLR-BD	626	SCE
1	EA	SURFACE CLOSER	4040XP SCUSH MC TBSRT	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DRIP CAP	16A	CL	NGP
1	SET	SEALS	5050CL	CLR	NGP
1	EA	DOOR SWEEP	200SA	CL	NGP
1	EA	THRESHOLD	659 MS/LA	AL	NGP

Hardware Group 15 - Exterior Storeroom Doors

For use on door(s):
107

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HW HINGE	3CB1HW SH 4.5 X 4.5 NRP	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	45H-7-D-3R 7/8 LTC	630	BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH SRI MC TBSRT	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DRIP CAP	16A	CL	NGP
2	EA	DOOR SWEEP	200SA	CL	NGP
1	EA	THRESHOLD	659 MS/LA	AL	NGP
2	EA	SILENCER	SR64	GRY	IVE

Factory installed astragal on active door.

Hardware Group 16 - Exterior Electric Room Doors

For use on door(s):
120A 120B

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HW HINGE	3CB1HW SH 4.5 X 4.5 NRP	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	45H-7-D-3R 7/8 LTC	630	BES
1	EA	MORTISE CYLINDER	30-001 114 (SDG&E-VTQP)	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH SRI MC TBSRT	689	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DRIP CAP	16A	CL	NGP
2	EA	DOOR SWEEP	200SA	CL	NGP
1	EA	THRESHOLD	659 MS/LA	AL	NGP
2	EA	SILENCER	SR64	GRY	IVE

Factory installed astragal on active door.

Hardware Group 17 - Utility Closet Pair of Doors

For use on door(s):
210 211 310

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	SET	CONST LATCHING BOLT	FB51T	630	IVE
1	EA	PASSAGE LATCH	45H-0-N-3R 7/8 LTC	630	BES
2	EA	OH STOP & HOLDER	90F	630	GLY
1	EA	ASTRAGAL	158NA	CL	NGP
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group 18 - Utility Closet Pair of Doors (Locking)

For use on door(s):
301

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HW HINGE	3CB1HW 4.5 X 4.5	630	IVE
1	SET	CONST LATCHING BOLT	FB51T	630	IVE
1	EA	STOREROOM LOCK	45H-7-D-3R 7/8 LTC	630	BES
2	EA	OH STOP & HOLDER	90F	630	GLY
1	EA	ASTRAGAL	158NA	CL	NGP
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group 19 - Roof Access Scuttle

For use on door(s):
217B

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	3CB1HW SH 4.5 X 4.5 NRP	630	IVE
1	EA	DEAD-LOCK	48H-7-L	626	BES
1	EA	LOCK GUARD	LG12	630	IVE
1	EA	DOOR PULL, 3/4" RND	8102HD 6" H-I-L	630	IVE
1	EA	SURFACE CLOSER	4040XP SHCUSH MC TBSRT	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	5050CL	CLR	NGP

(4) Sided door frame.

Hardware Group G-01 - Site Gates

For use on door(s):
NE GATE SE GATE

Qty		Description	Catalog Number	Finish	Mfr
1	EA	COMMUNICATING LOCK	45H-7-G-3R	630	BES
1	EA	GATE CLOSER	TB950 MAGNUM BALANCE OF HARDWARE BY GATE MANUFACTURER	BLK	LKY

Hardware Group G-02 - Powered Sliding/Swinging Gate Combination

For use on door(s):
POWERED
GATE

Qty	Description	Catalog Number	Finish	Mfr
		ACCESS CONTROL BY OTHERS HARDWARE BY GATE MANUFACTURER POWER SUPPLY BY OTHERS		

Hardware Group RU-01 - Coiling/Roll-up Doors

For use on door(s):
109A 109B 109C 109D 109E

Qty	Description	Catalog Number	Finish	Mfr
		HARDWARE BY DOOR / FRAME MANUFACTURER		

Hardware Group SF-01 - Lobby Entrance Door

For use on door(s):
100

Qty		Description	Catalog Number	Finish	Mfr
1	EA	PIVOT SET	7226F SET	630	IVE
2	EA	INTERMEDIATE PIVOT	7226F INT	630	IVE
1	EA	ELEC CLASSROOM LOCK	CO-200-MS-70-KP-TLR-BD	626	SCE
1	EA	PERMANENT CORE	OWNER SUPPLIED	626	BES
1	EA	CONCEALED CLOSER	2031 HO WMS	689	LCN
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	DOOR SWEEP	200SA	CL	NGP
1	EA	THRESHOLD	659 MS/LA	AL	NGP
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

Wide stiles must be used to accommodate the specified lock (see door type "C", plan page A7.3)

Hardware Group SF-02 - 2nd Floor Deck Door

For use on door(s):
207

Qty		Description	Catalog Number	Finish	Mfr
1	EA	PIVOT SET	7226F SET	630	IVE
1	EA	INTERMEDIATE PIVOT	7226F INT	630	IVE
1	EA	ELEC CLASSROOM LOCK	CO-200-MS-70-KP-TLR-BD	626	SCE
1	EA	PERMANENT CORE	OWNER SUPPLIED	626	BES
1	EA	SURFACE CLOSER	4040XP SHCUSH MC TBSRT	689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	BLADE STOP SPACER	4040XP-61	689	LCN
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	DOOR SWEEP	200SA	CL	NGP
1	EA	THRESHOLD	659 MS/LA	AL	NGP
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

Wide stiles must be used to accommodate the specified lock (see door type "C", plan page A7.3)

Hardware Group SF-03 - Corridor Door (Push/Pull)

For use on door(s):
104B

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	SET	PUSH/PULL BAR	9103EZHD-12"-STD	630	IVE
1	EA	SURFACE CLOSER	4040XP H MC TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOOR SWEEP	200SA	CL	NGP
1	EA	THRESHOLD	613 MS/LA	AL	NGP
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

Hardware Group SF-04 - Day & Weight Room Doors (Push/Pull)

For use on door(s):
212A 212B 214A

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	SET	PUSH/PULL BAR	9103EZHD-12"-STD	630	IVE
1	EA	SURFACE CLOSER	4040XP H MC TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	FLOOR STOP	FS439	682	IVE
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

Hardware Group SF-05 - Day & Weight Room Doors (Push/Pull)

For use on door(s):
214B

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	SET	PUSH/PULL BAR	9103EZHD-12"-STD	630	IVE
1	EA	SURFACE CLOSER	4040XP SHCUSH MC TBSRT	689	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

Hardware Group SL-01 - Dining/Patio Sliding Doors

For use on door(s):
213

Qty	Description	Catalog Number	Finish	Mfr
		HARDWARE BY DOOR / FRAME MANUFACTURER		

This opening requires two lock mechanisms; one integrated sliding door lock and two bottom track "slide locks".

Miscellaneous Items

Qty		Description	Catalog Number	Finish	Mfr	Handing
1	EA	HANDHELD DEVICE	HHD KIT		SCE	
1	EA	KEY CABINET	SENIOR S2100	GRY	TEL	

END OF SECTION

SECTION 08 71 00.13

FINISH HARDWARE (TEMPORARY FIRE STATION)

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. Mechanical and electrified door hardware for:

   a. Swinging doors.
   b. Gates.

2. Field verification, preparation and modification of existing doors and frames to receive new door hardware.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section “Alternates” for alternates affecting this section.
2. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
3. Division 09 sections for touchup finishing or refinishing of existing openings modified by this section.
4. Division 26 sections for connections to electrical power system and for low-voltage wiring.
5. Division 28 sections for coordination with other components of electronic access control system.

1.3 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

1.4 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 requirements.
2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.

B. Action Submittals:

1. Product Data: Product data including manufacturers’ technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Samples for Verification: If requested by Architect and Resident Engineer, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.

    a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect and Resident Engineer may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

3. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

    a. Door Index; include door number, heading number, and Architects hardware set number.
    b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
    c. Type, style, function, size, and finish of each hardware item.
    d. Name and manufacturer of each item.
    e. Fastenings and other pertinent information.
    f. Location of each hardware set cross-referenced to indications on Drawings.
    g. Explanation of all abbreviations, symbols, and codes contained in schedule.
    h. Mounting locations for hardware.
    i. Door and frame sizes and materials.
    j. Name and phone number for local manufacturer's representative for each product.

k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
   1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

4. Key Schedule [Provided by City of San Diego]:

   a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
   b. Use ANSI/BHMA A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
      1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.

   f. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.

5. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product Certificates for electrified door hardware, signed by manufacturer:

   a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Certificates of Compliance:

   a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect and Resident Engineer or Authority Having Jurisdiction.
   b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in “QUALITY ASSURANCE” article, herein.

4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
5. Warranty: Manufacturer’s standard warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data : Provide in accordance with Division 01 and include:

a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Name, address, and phone number of local representative for each manufacturer.
d. Final approved hardware schedule, edited to reflect conditions as-installed.
e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.5 QUALITY ASSURANCE

A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.

1. Where specific manufacturer's product is named and accompanied by "No Substitute," including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)

a. Where no additional products or manufacturers are listed in product category, requirements for "No Substitute" govern product selection.

2. Where products indicate "acceptable manufacturers" or "acceptable manufacturers and products", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein.

B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect and Resident Engineer, and Contractor, at reasonable times during the Work for consultation.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and Resident Engineer and electrical engineers and provide installation and technical data to Architect and Resident Engineer and other related subcontractors.

a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.

D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
2. Can provide installation and technical data to Architect and Resident Engineer and other related subcontractors.
3. Can inspect and verify components are in working order upon completion of installation.
4. Capable of producing wiring diagrams.
5. Capable of coordinating installation of electrified hardware with Architect and Resident Engineer and electrical engineers.

E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

I. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.

J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
2. Maximum opening-force requirements:

   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
   b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
   c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.

K. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 [If required by the City of San Diego]. .

1. Attendees: Owner, Contractor, Architect and Resident Engineer, Installer,[Owner's security consultant,] and Supplier's Architectural Hardware Consultant.
2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
b. Preliminary key system schematic diagram.
c. Requirements for key control system.
d. Requirements for access control.
e. Address for delivery of keys.
f. . <Insert requirements to suit Project>.

L. Pre-installation Conference: Conduct conference at Project site <Insert alternate location>.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review sequence of operation for each type of electrified door hardware.
3. Review required testing, inspecting, and certifying procedures.

M. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.

a. Attendees: Door hardware supplier, door hardware installer, Contractor.
b. After meeting, provide letter of compliance to Architect and Resident Engineer, indicating when meeting was held and who was in attendance.

2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner,[Owner's security consultant,] Architect and Resident Engineer and Contractor.
b. After meeting, provide letter of compliance to Architect and Resident Engineer, indicating when coordination conference was held and who was in attendance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1. Deliver each article of hardware in manufacturer's original packaging.

C. Project Conditions:

1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:

1. Promptly replace products damaged during shipping.
2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

1.7 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

F. Direct shipments not permitted, unless approved by Contractor.

1.8 WARRANTY

A. Warranty: Manufacturer's standard warranty form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date of Substantial Completion, for durations indicated.

a. Closers:
1) Mechanical: 10 years for Falcon SC series
2) Electrified: 2 years.

b. Locksets:
   1) Mechanical: 3 years.
   2) Electrified: 1 year.

c. Key Blanks: Lifetime

2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”

1. Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers and/or products other than those listed as ”Scheduled Manufacturer ” or “Acceptable Manufacturers” in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

C. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

E. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect’s and Resident Engineer's approval.

2.2 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect and Resident Engineer if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.3 HINGES

A. Provide three-knuckle, concealed bearing hinges.

1. Manufacturers and Products:

a. Scheduled Manufacturer and Product: Ives 3CB series or equal.
b. Acceptable Manufacturers and Products: Hager AB series, McKinney TA series or equal.

B. Requirements:

1. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

2. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

3. 2 inches or thicker doors:

a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
b. Interior: Heavy weight, steel, 5 inches (127 mm) high

4. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
5. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

a. Steel Hinges: Steel pins
b. Non-Ferrous Hinges: Stainless steel pins
c. Out-Swinging Exterior Doors: Non-removable pins
d. Out-Swinging Interior Lockable Doors: Non-removable pins
e. Interior Non-lockable Doors: Non-rising pins

7. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
8. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
10. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.

11. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

2.4 CYLINDRICAL LOCKS – GRADE 2

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage AL Series or equal.
2. Acceptable Manufacturers and Products: Best 73KC series, Corbin-Russwin CL3900 series, Sargent 7-Line or equal.

B. Requirements

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 2. Cylinders: Refer to “KEYING” article, herein.
2. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch (13 mm) latch throw. Provide 2-3/8 inches (60 mm) backset where noted of if door or frame detail requires. Provide proper latch throw for UL listing at pairs.
3. Provide locksets with separate anti-rotation throughbolts, and no exposed screws. Provide levers that operate independently, and have two external return spring cassettes mounted under roses to prevent lever sag.
4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
5. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

    a. Lever Design: Schlage Neptune. or equal.
    b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.5 ELECTRONIC ACCESS CONTROL LOCKSETS AND EXIT DEVICE TRIM

A. Manufacturers:

1. Scheduled Manufacturer: To establish standard of quality and design intent, electronic access control locksets and exit device trim specifications have been based on Schlage. Products of other manufacturers meeting or exceeding design and performance requirements specified herein will be considered for substitution subject to compliance with provisions of Division 01 Section “Product Requirements.”

B. Product: Schlage CO-100-CY standalone bored-type electronic lockset.

1. Provide bored cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, non-handed, field-reversible.
2. Backset: 2-3/4-inch (70 mm).
3. Latchbolt Throw: 1/2-inch (13 mm) unless noted otherwise. Provide 3/4-inch (19 mm) throw for UL listing at pairs.
4. Chassis: Standard 161 cylindrical lock prep for 1-3/4-inch (44 mm) doors

C. Requirements:

1. Provide offline electronic access control products that comply with the following requirements:

   a. Listed, UL 294 - The Standard of Safety for Access Control System Units.
   b. Compliant with ANSI/BHMA A156.25 Grade 1 Operation and Security.
   c. Certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAS 202 and TAS 203.
   d. Compliant with ASTM E330 for door assemblies.
   e. Compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada RSS-210.

2. Functions: Provide functions as scheduled that are field configurable without taking the wireless electronic product off the door.
3. Emergency Override: Provide mechanical key override; cylinders: Refer to “KEYING” article, herein.
4. Levers:

   a. Vandal Resistance: Exterior (secure side) lever rotates freely while door remains locked, preventing damage to internal lock components from vandalism by excessive force.
   b. Provide non-handed lever trim that operates independently of non-locking levers.
   c. Style: Sparta (17) or equal.
   d. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

5. Power Supply: 4 AA batteries

   a. Provide electronic access control locks and/or exit device trim with the ability to communicate battery status.

6. Features:

   a. Visual tri-colored LED indicators that indicate activation, operational systems status, system error conditions and low power conditions.
   b. Visual bi-colored LED indicator on interior that is capable of indicating secured/unsecured status of device to occupants on interior.
   c. Audible feedback that can be enabled or disabled.
   d. Onboard processor with memory capacity of 2,000 users, 2,000 event audit history, up to 16 time zones and up to 32 calendar events.
   e. Tamper-Resistant Screws: Tamper torx screws on inside escutcheon for increased security.
   f. Lockdown Function:
      1) Provide electronic access control locks and/or exit device trim with lockdown function with a remote Fob for immediate lockdown of lock restricting entrance to authorized credentials. Free egress always from non-secure side of lock.
      2) Provide 1 Remote Lockdown Fob that will be paired to each lock.
      3) Provide electronic access control locks and/or exit device trim with lockdown function capable of being paired with up to 10 Remote Lockdown Fobs. Provide one Remote Lockdown Fob to be paired with lock. Remote Lockdown Fob shall be capable of being paired with up to 10 locks. Remote Lockdown Fob shall have one button to initiate lockdown with Paired Lock and a separate button to reset locks that are paired to it from lockdown. Range of Remote Lockdown Fobs up to 75 feet on secured side and up to 25 feet on exterior side of door based upon typical building construction.

7. Switches:

    a. Mechanical Key Override

2.6 CYLINDERS

A. Manufacturer:

1. Scheduled Manufacturer: EXISTING BEST KEY SYSTEM or equal.
2. Approved Manufacturers and Products: No Substitute.

B. Requirements: Provide cylinders/cores complying with the following requirements.

1. Furnished by same manufacturer as locks.
2. Cylinders/cores compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated.

C. . [Manufacturer-keyed permanent cylinders/cores, configured into existing keying system per "KEYING" article herein.]

1. . <provide contact information if the Owner or Owners representative are to provide the permanent cylinders and/or cores>
2. Features: Cylinders/cores shall incorporate the following features.

D. Nickel silver bottom pins.

1. Identification:

E. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.

F. Identification stamping provisions must be approved by the Architect and Resident Engineer.

G. Construction Keying System.

H. 3 construction control keys and extractor tool, if required.

I. 12 construction change (day) keys.

1. Owner or Owner's Representative will void operation of temporary construction keys.

J. Replaceable Construction Cores.

1. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.

K. 12 construction change (day) keys.

1. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.7 KEYING [EXISTING BEST KEY SYSTEM PROVIDED BY CITY OF SAN DIEGO]

A. Keying System: Factory registered, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Keying System: Existing system maintained by Owner or Owners representative, incorporating decisions made at keying conference.

C. Keys

1. Material: Nickel silver; minimum thickness of .092-inch (2.3mm)
2. Identification:

D. Coordinate with cylinder/core and key identification requirements above.

E. Stamp keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.

F. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.

1. Quantity: Furnish in the following quantities.

a. Change (Day) Keys: 3 per cylinder/core.
b. Permanent Control Keys: 3.
c. Master Keys: 6.
d. Unused balance of key blanks shall be furnished to Owner with the cut keys.

e. Extra Keys:
1) Presentation Keys (quantity as determined by Architect and Resident Engineer)
2) Construction Keys (quantity as determined by Architect and Resident Engineer)

2.8 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Falcon SC80/SC81 series or equal.
2. Acceptable Manufacturers and Products: Norton 8501/8501BF series, Sargent 1331 series, Yale 3501/3501BF series or equal.

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
2. Provide door closers with fully hydraulic, full rack and pinion action with aluminum cylinder.
3. Closer Body: 1-1/4 inch (32 mm) diameter, with 5/8 inch (16 mm) diameter heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.

7. Pressure Relief Valve (PRV) Technology: not permitted.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.9 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal.
2. Acceptable Manufacturers: Rockwood, Trimco or equal.

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.10 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal.
2. Acceptable Manufacturers: Rockwood, Trimco or equal.

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:

    a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
    b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
    c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.11 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson or equal.
2. Acceptable Manufacturers: Rixson, Sargent or equal.

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.12 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal.
2. Acceptable Manufacturers: Rockwood, Trimco or equal.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.13 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: NGP or equal.
2. Acceptable Manufacturers: Pemko, Zero International or equal.

B. Requirements:

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size of thresholds::

   a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
   b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width

3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.14 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal.
2. Acceptable Manufacturers: Rockwood, Trimco or equal.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.15 COAT HOOKS

A. Manufacturers:

1. Scheduled Manufacturer: Ives or equal.
2. Acceptable Manufacturers: Rockwood, Trimco or equal.

B. Provide coat hooks as specified.

2.16 FINSHES

A. Finish: BHMA 626/652 (US26D); except:

1. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
2. Protection Plates: BHMA 630 (US32D)
3. Overhead Stops and Holders: BHMA 630 (US32D)
4. Door Closers: Powder Coat to Match
5. Wall Stops: BHMA 630 (US32D)
6. Latch Protectors: BHMA 630 (US32D)
7. Weatherstripping: Clear Anodized Aluminum
8. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Where on-site modification of doors and frames is required:

1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
2. Field modify and prepare existing door and frame for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:

   a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
   b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
   c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

H. Lock Cylinders: Install construction cores to secure building and areas during construction period.

I. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect and Resident Engineer.

J. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

K. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

L. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

M. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

N. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

O. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Architectural Hardware Consultant: Engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SCHEDULE

A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

B. Hardware Sets:

SpeXtra: 139691

Hardware Group 01 - Trailer Entrance Doors

For use on door(s):
104A 104B

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	3CB1 4.5 X 4.5 NRP	652	IVE
1	EA	ELEC CLASSROOM LOCK	CO-100-CY-70-KP-SPA-BD	626	SCE
1	EA	PERMANENT CORE	OWNER SUPPLIED	626	BES
1	EA	SURFACE CLOSER	SC81 SSHO	689	FAL
1	EA	CUSH SHOE SUPPORT	SC80-30	689	FAL
1	EA	DRIP CAP	16A	CL	NGP
1	SET	SEALS	5050CL	CLR	NGP
1	EA	DOOR SWEEP	200NA	CL	NGP
1	EA	THRESHOLD	659 MS/LA	AL	NGP

Hardware Group 02 - Trailer Entrance Doors

For use on door(s):
200A

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	ELEC CLASSROOM LOCK	CO-100-CY-70-KP-SPA-BD	626	SCE
1	EA	PERMANENT CORE	OWNER SUPPLIED	626	BES
1	EA	SURFACE CLOSER	SC81 SSHO	689	FAL
1	SET	SEALS	5050CL	CLR	NGP
1	EA	DOOR SWEEP	200NA	CL	NGP
1	EA	THRESHOLD	659 MS/LA	AL	NGP

Hardware Group 03 - Storage Closet Doors

For use on door(s):
103 107

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	3PB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	AL10S NEP	626	SCH
1	EA	OH STOP	450S	630	GLY

Hardware Group 04 - Storage Closet Doors

For use on door(s):
109

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	3PB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	AL10S NEP	626	SCH
1	EA	WALL STOP	WS406/407CVX	630	IVE

Hardware Group 05 - Dorm Room Doors

For use on door(s):
101 102 110 111

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	3PB1 4.5 X 4.5	652	IVE
1	EA	HOSPITAL PRIVACY	AL44S NEP	626	SCH
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	SET	SEALS	5050CL	CLR	NGP
1	EA	DOOR BOTTOM	220NA	CL	NGP
1	EA	THRESHOLD	613 MS/LA	AL	NGP
1	EA	COAT AND HAT HOOK	405	673	IVE

Hardware Group 06 - Toilet Room Doors

For use on door(s):
105 106

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	3PB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	AL40S NEP	626	SCH
1	EA	OH STOP	450S	630	GLY
1	SET	SEALS	5050CL	CLR	NGP
1	EA	COAT AND HAT HOOK	405	673	IVE

Hardware Group G-01 - Site Gates

For use on door(s):
NE GATE SE GATE

Qty	Description	Catalog Number	Finish	Mfr
		HARDWARE BY GATE MANUFACTURER		

Hardware Group R-01 - Coiling/Roll-Up Door

For use on door(s):
200B

Qty	Description	Catalog Number	Finish	Mfr
		HARDWARE BY DOOR / FRAME MANUFACTURER		

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:
1. Section 08 11 13 - Steel Doors and Frames
2. Section 08 14 00 - Wood Doors
2. Section 08 41 13 - Aluminum Entrances and Window Walls.
3. Section 08 51 13.13 - Aluminum Windows

1.02 PERFORMANCE REQUIREMENTS

A. Glass and glazing materials shall provide continuity of building enclosure vapor and air barrier.
1. To utilize the inner pane of multiple pane sealed units for the continuity of air and vapor seal.
2. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

B. Glass thickness indicated is minimum and shown for detailing only. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with IBC Chapter 24, as measured in accordance with ANSI/ASTM E330.

C. Limit glass deflection to 1/175 or flexure limit of glass, with full recovery of glazing materials, whichever is less.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's Product Data for glass units, including the following:
1. Structural, physical and environmental characteristics.
2. Size limitations.
3. Special handling or installation requirements
4. Special application requirements for glazing materials.
5. Available colors of glass and glazing materials with color selections.

B. Samples: Submit samples as follows:
1. Two samples 8 x 8 inch in size, illustrating glass units, coloration and design.
2. Four inch long bead of glazing sealant, color as selected.

C. Manufacturer's Certificate: Submit Manufacturer's certification that sealed insulated glass meets or exceeds specified requirements.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

E. Calculations: Submit calculations to verify that the exterior glazing thickness complies with ASTM E1300 in accordance with IBC 2404.1.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Conform to IBC Chapter 24, to local requirements and to State law.

B. Standards:
1. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
2. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
3. GANA'S - Glazing Manual and Laminated Glass Design Guide.

C. Perform Work in accordance with GANA Glazing Manual, GANA Sealant Manual, and Laminators Safety Glass Association - Standards Manual for Glazing Installation Methods.

1.05 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

1.06 WARRANTY

A. Provide 10 year Manufacturer's standard warranty for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Materials: Furnish products of one of the following Manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with Specification requirements:
1. PPG Industries. www.ppg.com (Basis of Design)
2. Viracon. www.viracon.com.
3. Guardian Industries. www.guardian.com .
4. Oldcastle Glass Group. www.oldcastleglass.com .
5. Pilkington LOF. www.pilkington.com .
6. Visteon Float Glass www.visteon.com .
7. Or equal.

2.02 MATERIALS – GENERAL

A. Provide regional materials in accordance with Regional Materials provisions of Section 01 60 00.

2.03 GLASS MATERIALS

A. Exterior:
1. Minimum 1" insulated glazing units at all exterior windows.
2. Provide warm-edge spacer where available for specified window type and manufacturer to limit potential for condensation.
3. Provide glazing with minimal shading coefficient and highest VLT to maintain SHGC.
4. Provide equivalent insulated units at vision panels in exterior doors.
5. Provide as tempered or heat strengthened where required by code.
6. Basis of design: PPG Solarban 60 or equal with clear inner lite and solar bronze outer lite:
   a. U-value per Title 24 Energy Calculations
   b. VLT per Title 24 Energy Calculations
   c. SHGC per Title 24 Energy Calculations

B. Interior (Non-Fire Rated):
1. Float Glass: Clear, 1/4" thick, ASTM C1036, Type 1 transparent flat, Class 1.
2. Tempered Float Glass (where required by Building Code): 1/4" thick, clear fully tempered glass conforming to ASTM C 1048.
3. Wire Glass: ASTM C1036, Type II patterned and wired flat, Class 1 tranlucent, Quality q8 glazing; square mesh, ¼ inch thick.

C. Interior (Fire Rated): Provide one of the following as applicable. Doors shall have glazing that has impact resistance meeting CPSC 16CFR1201 (Cat. I or II).
1. FireLite Plus Premium (polished surfaces), 60 minute fire rated, 3/16 inch thick, as manufactured by Technical Glass Products, Nippon Electric Glass Co., Ltd. www.fireglass.com or equal.
2. Superlite I-XL, 60 minute fire rated, optically clear, 1/4 inch thick, as manufactured by SAFTI (Safety and Fire Technology International), San Francisco, CA (800) 822-2088 www.safti.com or equal.

D. Interior Mirror Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q1 mirror select; 1/4 inch thick, sizes noted on Drawings. Provide full width mirror with polished edges (no frames).

E. Interior Laminated Glass: 2 layers of 3/16 inches around 0.060 Safeflex inner layer, clear or equal.

2.04 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness tested for compatibility with glazing sealant, minimum length 4 inches.

B. Spacers: Neoprene blocks of 40 to 50 Shore A durometer hardness, adhesive backed on one face only and tested for compatibility with specified glazing sealant.

C. Glazing Gaskets: As specified in Section 08 41 13.

D. Interior Glazing Compound:
1. Polymerized Butyl Rubber and Inert Fillers (pigments), solvent based with minimum 75% solids, non-sag consistency, tack-free time of 24 hours or less, paintable non-staining.
2. In accordance with the low-emitting materials requirements of Section 01 60 00 – Product Requirements.

E. Exterior Glazing Compound: Conforming to ASTM C920, Type S, Grade NS, Use G. Compound shall be paintable, or colored to match frame.

F. Glazing Tape: Preshimmed 10 percent solids, non-shrinking, butyl rubber tape compatible with sealants. If exposed, tape shall be paintable, or colored to match frame.

G. Butt Glazing Sealant:
1. Interior:
   a. GE 1200 Series Silicone, clear or equal.
   b. In accordance with the low-emitting materials requirements of Section 01 60 00 – Product Requirements.
2. Exterior: GE 1200 Series Silicone, gray or equal.

H. Mirror Mastic: Polymer type mirror mastic (compliant with the low-emitting materials requirements of Section 01 60 00 – Product Requirements) resistant to water, shock, cracking, vibration and thermal expansion. Mastic shall be compatible with mirror backing paint and approved by mirror manufacturer.

I. Mirror Vandal-Resistant Film: Scratchgard® as manufactured by ShatterGARD Glass Protection Films®, Inc. (888) 306- 7998www.shattergard.com or equal. All mirrors in project are to have Mirror Vandal-Resistant Film

2.07 MARKINGS

A. Tempered glass shall have each light permanently etched with Manufacturer's name and his compliance with ANSI Z-97.1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Examine framing or glazing channel surfaces, backing, removable stop design, and conditions under which glazing is to be performed.

C. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Comply with combined recommendations of Glass Manufacturer, aluminum frame manufacturer and manufacturer of sealants and other materials used in glazing., except where more stringent requirements are shown or specified.

B. Clean the glazing, channel, or other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to the substrate.

C. Do not attempt to cut, seam, nip or abrade glass which is tempered or heat strengthened.

D. Comply with "Glazing Manual" by GANA, except as shown and specified otherwise by Manufacturers of glass and glazing materials.

E. Inspect each piece of glass immediately before installation, and discard those which have observable edge damage or face imperfections.

F. Install setting blocks of proper size at quarter points of sill rabbet.

G. Provide spacers inside and out, and of proper size and spacing, for glass sizes larger than 50 united inches. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width.

H. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.

I. Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in the glazing system.

3.03 EXTERIOR COMBINATION METHOD (TAPE AND SEALANT)

A. Clean contact surfaces with solvent.

B. Cut glazing tape to proper length and set against permanent stops, 3/16 inch below sightline. Weld corners together by butting tape and dabbing with sealant.

C. Apply bed of sealant along exterior void ensuring full contact with glass.

D. Place setting blocks at 1/4 points.

E. Rest glass on setting blocks and push against tape (and heel bead of sealant) with sufficient pressure to ensure full contact and adhesion at perimeter.

F. Install removable stops, spacer strips inserted between glass and applied stops at 2-foot intervals, 1/4 inch below sightline. Place glazing tape on glass with tape flush with sightline.

G. Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass but not more than 3/8 inch below sightline.

H. Apply cap bead of sealant along exterior void, to uniform and level line, flush with sightline. Tool or wipe cap bead surface with solvent for smooth appearance.

3.04 INTERIOR COMBINATION METHOD (TAPE AND SEALANT)

A. Cut glazing tape to proper length and install against permanent stop, projecting 1/16 inch above sightline.

B. Place setting blocks at 1/4 point.

C. Rest glass on setting blocks and push against tape with sufficient pressure to ensure full contact and adhesion at perimeter.

D. Install removable stops; spacer strips inserted between glass and applied stops at 2 foot intervals, 1/4 inch below sightline.

E. Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass to uniform and level line.

F. Neatly trim off excess tape to sightline.

3.05 ADHESIVE INSTALLATION OF MIRRORS

A. Apply mirror mastic to cover not more than 25 percent of back of mirror.

B. Set mirror in support on setting blocks or continuous gasket, and press against substrate to ensure bond of adhesive.

C. Leave open ventilation space, 1/8 inch or more in thickness between mirror and substrate, over 75 percent of mirror area (wherever there is no adhesive).

3.06 ADJUSTING

A. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in any other way during the construction period, including natural causes, accidents and vandalism.

3.07 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Remove labels after Work is completed.

C. Construction Waste: In accordance with Section 01 74 19.

3.08 PROTECTION

A. Protect glass from breakage immediately upon installation, by attachment of crossed streamers to framing held away from glass.

B. Do not apply markers of any type to surfaces of glass.

END OF SECTION

SECTION 09 22 16

METAL SUPPORT ASSEMBLIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Formed metal stud framing, furring, suspension systems and accessories as shown on Drawings and as specified.

1.02 SYSTEM DESCRIPTION

A. Interior walls shall be non-load bearing studs for walls going to ceiling and load bearing steel studs (as specified in Section 05 41 00) for walls going to structure.
   1. Studs: 3-5/8", 22 gauge metal studs conforming to ASTM C-645. Use 20 gauge for walls to receive ceramic tile and for walls over 14 feet high or unless otherwise called for in drawings.
   2. Metal Furring Channels: 22 gage galvanized steel with a face width of 1-3/8 inch and furring depth to match insulation thickness (see Section 07 21 00).

1.03 SUBMITTALS

A. Product Data: Submit data describing standard framing member materials and finish, product criteria, load charts, limitations, and installation instructions.

B. Certificates: Mill Certification shall be provided with shipment to verify chemical composition, yield strength, tensile strength, elongation and coating thickness. Include listing of applicable ASTM standards specified in this section and comparison of ASTM requirements to actual materials provided to jobsite.

C. Manufacturer's letter: Manufacturer shall provide letter stating that the material supplied to the specific project meets or exceed the performance standards listed in these specifications.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C 754 requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products as manufactured by a manufacturing member of the Steel Stud Manufacturers Association (SSMA) or equal, subject to compliance with Specification requirements.

2.02 FRAMING MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide regional materials in accordance with Regional Materials provisions of Section 01 60 00.

B. Studs, Runners and Furring Channels:
1. ASTM C 645, electro-galvanized to meet ASTM A 591, manufactured from steel supplied in accordance with ASTM A 653, Structural Quality Grade 33; G60 designation galvanized sheet steel.
2. Thickness: In accordance with stud schedule provided herein.
3. Deflection Track:
a. Slottted Top Track (non-fire rated and fire-rated, as applicable): SLP-TRK® as manufactured by Sliptrack Systems (888) 475-7875 www.BradyInnovations.com, as distributed by Cemco (800) 775-2362 (western U.S) and Unimast Inc. (800) 654-7883 (eastern U.S.) or euqal, gauge as per ICBO ER-5344, Table 2. Provide fire rated assemblies in accordance with manufacturer's literature, where applicable.
b. Non-Fire Rated Slotted Top Track - Single Track Slip System for Interior Partitions: As manufactured by Metal Lite, Inc., 3070 E. Miraloma Avenue, Anaheim, CA 92806 (800) 886-6824 or equal. Provide for partitions that are not required to be fire rated.
4. Curved Stud and Track Components: Custom curved stud and track components as manufactured by RadiusTrack Corporation, 6612 Lyndale Avenue So., Suite 2, Richfield, MN 55423 (888) 872-3487 or equal.

C. Studs: C-shaped, non-load bearing rolled steel, punched for utility access, of size shown on Drawings.

D. Ceiling Runners: Cold or hot-rolled steel, meet ASTM C 754.

E. Hanger and Tie Wire: Meet ASTM C 754.

F. Furring and Bracing Members: Of same gauge, material and finish as studs, thickness to suit purpose.

G. Clips, Brackets: Galvanized wire or sheet metal designed for attachment of framing, furring and bridging members.
1. Deflection Clips: If acceptable to Building Official, VertiClip™ as manufactured by Signature Industries, LLC, P.O. Box 68005, Raleigh, NC 27613 (919) 844-0789 or equalmay be provided for attachment of framing to roof and floor construction at head and slide conditions. Provide sizes as required for stud depth(s). Clips shall be manufactured of steel conforming to ASTM A 653 Prime Certified G60 galvanized material or better, 50 ksi yield strength and 65 ksi ultimate strength. Deflection clips to have positive attachment to structure and stud material while allowing for frictionless movement.
2. Bridging Clips: If acceptable to Building Official, BridgeClip™ as manufactured by Signature Industries, LLC, P.O. Box 68005, Raleigh, NC 27613 (919) 844-0789 or equalmay be provided for attachment of bridging to studs.

H. Fasteners: GA 203, self-drilling, self-tapping screws.

I. Anchorage Devices: Power driven, powder actuated, drilled expansion bolts or screws with sleeves as required for positive anchorage.

J. Acoustic Sealant: As specified in Section 07 92 20.

K. Primer: FS TT-P-645, for touch-up of galvanized surfaces.

L. Backing: "Notch-Tite" and "Flush Mount" as manufactured by Metal Lite, Inc., 3070 E. Miraloma Avenue, Anaheim, CA 92806 (800) 886-6824 or equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are ready to receive Work.

B. Verify field measurements are as shown on Drawings.

C. Verify that rough-in utilities are in proper location.

D. Beginning of installation means acceptance of substrate.

3.02 METAL STUD ERECTION

A. Install stud framing in accordance with ASTM C 754.

B. Align and secure top and bottom runners at 24 inches o.c. Place two beads of acoustic sealant between runners and substrate.

C. Fit runners under and above openings; secure intermediate studs at spacing of wall studs.

D. Install studs vertically at 16 inches on center; unless indicated otherwise on Drawings. Place two beads of acoustic sealant between studs and adjacent vertical surfaces. Install felt strips between wall and stud where studs abut exterior walls.

E. Connect studs to tracks using fastener method.

F. Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.

G. Backing and Blocking: Provide backing and blocking attached to studs. Bolt or screw steel channels to studs. Install backing and blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, and hardware. If proprietary system is used, install in accordance with manufacturer's printed instructions.

H. Coordinate installation of bucks, anchors, blocking, electrical and mechanical Work placed in or behind partition framing.

I. Splice studs with 8 inch nested lap, secure each stud flange with flush head screw.

J. Construct corners using minimum three studs.

K. Brace stud framing system and make rigid.

L. Coordinate erection of studs with requirements of door and window frame supports and attachments.

M. Align stud web openings.

N. Refer to Drawings for indication of partitions extending to ceiling only and for partitions extending through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide nested extended leg ceiling runners, deflection clips or proprietary slip track.

O. Coordinate placement of insulation in multiple stud spaces made inaccessible after stud framing erection.

3.03 WALL FURRING INSTALLATION

A. Erect wall furring for direct attachment to structural walls.

B. Erect furring channels vertically. Secure in place on alternate channel flanges at maximum 24 inches.

C. Space furring channels maximum 16 inches on center, not more than 4 inches from floor and ceiling lines, and butting walls.

D. Install furring channels directly attached to structural walls, as applicable in accordance with Manufacturer's instructions.

E. Erect free-standing metal stud framing tight to concrete, concrete and brick masonry walls, attached by adjustable furring brackets in accordance with Manufacturer's instructions.

3.04 ACOUSTICAL AND FIRE RATINGS

A. Install framing and furring as required for indicated acoustical and fire ratings.

3.05 CEILING FRAMING INSTALLATION

A. Install in accordance with ASTM C 754.

B. Coordinate location of hangers with other Work.

C. Install ceiling framing independent of walls, columns and above-ceiling Work.

D. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches beyond each end of openings.

E. Laterally brace entire suspension system.

F. No hanger support shall be allowed from roof deck.

G. At steel beams, joists or other steel construction wrap hangers around, inset through, or clip or bolt to the supports, so as to develop the full strength of the hangers.

H. At lights or other openings that interrupt the main runner or furring channels reinforce grillage with 3/4 inch cold-rolled channels, wire tied atop and parallel to the main runner channels.

I. Do not bridge control and expansion joints with metal furring. Provide separate supports on each side of joint.

J. Fabricate and bend curved furring to required curves and radii in the shop.

3.06 FIELD QUALITY CONTROL

A. Testing: At Owner's request, Contractor shall provide spot testing of actual properties of steel framing to verify compliance with specifications.

3.07 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19 .

3.08 STUD SCHEDULE

A. Stud Table: Maximum limits based upon 5 psf deflection limit, 33 ksi yield stress, and composite wall sheathed both sides full height with 1/2 inch thick gypsum wallboard attached with No. 6 screws at 12 inches on center minimum, from the SSMA "Product Technical Information" - "Wall Height Tables for Composite Allowable Wall Heights." Maximum allowable deflection as follows:
1. Walls receiving gypsum wallboard finishes: L/240.
2. Walls receiving plaster and brittle finishes, including stucco, stone masonry, and mirrors: L/360.
3. Walls receiving ceramic and stone tile finishes: L/360.

STUD WIDTH	DESIGN THICKNESS (Gauge)	STUD SPACING	PARTITION HEIGHT		BRACING SPACING WHERE OCCURS
			L/240	L/360	
1 5/8”	18 mils .0188 in. (25)	16	8’ – 4”	---	4’ – 0” O.C.
		24	7’ – 11”	---	4’ – 0” O.C.
	33 mils .0346 in. (20)	16	9' – 8"	8’-5”	4’ – 0” O.C.
		24	8' – 9"	7’-8”	4’ – 0” O.C.
2-1/2”	18 mils .0188 in. (25)	16	11’ – 3”	9’-10”	6’ – 0” O.C
		24	10’ – 7”	9’-3”	6’ – 0” O.C
	33 mils .0346 in. (20)	16	12’ – 10”	11’-2”	6’ – 0” O.C
		24	11’ – 7”	10’-0”	6’ – 0” O.C
3-1/2”	18 mils .0188 in. (25)	16	14’ – 4”	12’-4”	8’ – 0” O.C
		24	13’ – 5”	11’-7”	8’ – 0” O.C
	33 mils .0346 in. (20)	16	16’ – 5”	14’-3”	8’ – 0” O.C
		24	14’ – 9”	12’-9”	8’ – 0” O.C

continued

STUD WIDTH	DESIGN THICKNESS (Gauge)	STUD SPACING	PARTITION HEIGHT		BRACING SPACING WHERE OCCURS
			L/240	L/360	
4”	18 mils .0188 in. (25)	16	15’ – 4”	13’-4”	8’ – 0” O.C
		24	14’ – 2”	12’-4”	8’ – 0” O.C
	33 mils .0346 in. (20)	16	18’ – 4”	15’-11”	8’ – 0” O.C
		24	16’ – 5”	14’-3”	8’ – 0” O.C
6”	18 mils .0188 in. (25)	16	19’ – 9”	17’-11”	10’ – 0” O.C
		24	16’ – 9”	16’-9”	10’ – 0” O.C
	33 mils .0346 in. (20)	16	24’ – 6”	21’-4”	10’ – 0” O.C
		24	21’ – 7”	18’-10”	10’ – 0” O.C

END OF SECTION

SECTION 09 24 00

PORTLAND CEMENT PLASTER (STUCCO)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section Includes: Integral colored stucco over fiberglass faced gypsum sheathing panels.

B. Related Sections:
1. Section 04 21 33 – Thin Brick Veneer Masonry: Thin brick masonry units over brown/scratch coat waterproof system over fiberglass faced gypsum sheathing panels
2. Section 05 41 00 - Load-Bearing Metal Stud System: Metal Framing at exterior wall construction.
3. Section 07 42 43.13 - Solid Composite Exterior Wall Panel Systems: Exterior panel dry system over breathable underlayment membrane over fiberglass faced gypsum sheathing panels.

1.02 SUBMITTALS

A. Product Data:
1. Provide Manufacturer's data on plaster materials, characteristics and limitations, and installation instructions.
2. Provide product data for weather resistive barrier including manufacturer's specifications, technical data and installation instructions. Submit manufacturer certification that weather resistive barrier product furnished meet specification requirements.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Comply with applicable requirements of the following, except where more stringent requirements are specified or required by local building codes:
1. ML/SFA 920, "Guide Specifications for Metal Lathing and Furring."
2. ASTM C926, "Standard Specification for the Application of Portland Cement-Based Plaster."
3. Provide weather resistive barriers that are manufactured in accordance with ICC approval acceptable to authorities having jurisdiction as a weather resistive barrier.

B. Field Samples: Make 2 samples, each 3 feet square at locations directed by Architect and Resident Engineer, for each specified stucco finish and color. Sample which has been reviewed and accepted by Architect and Resident Engineer may remain as part of the Work.

1.04 DELIVERY, STORAGE AND HANDLING

A. Portland Cement Plaster
1. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
2. Storage: Adequately protect against damage while stored at the site.
3. Handling: Comply with Manufacturer's instructions.

B. Weather Resistive Barrier:
1. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
2. Storage: Store off ground to assure adequate ventilation, and protect against damage while stored at the site.
3. Handling: Comply with manufacturer's instructions.

C. Gypsum Sheathing:
1. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
2. Storage: Store panels flat in an enclosed shelter providing protection from damage and exposure to the elements.

1.05 PROJECT/SITE CONDITIONS

A. Perform Work only when existing and forecasted weather conditions are within the limits established by the Manufacturer of the materials and products used.

B. Proceed with installation only when substrate construction and preparation Work is complete, dry and in condition to receive weather resistive barrier.

C. Do not apply plaster when substrate or ambient air temperature is less than 50 degrees F. nor more than 80 degrees F.

D. Maintain minimum ambient temperature of 50 degrees F. during and after installation of plaster.

E. During hot weather protect stucco from uneven and excessive evaporation.

1.06 WARRANTY

A. Gypsum Sheathing:
1. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay).
2. Manufacturer’s Standard Warranty: Five years against manufacturing defects.

PART 2 PRODUCTS

2.01 PLASTER MATERIALS

A. General:
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Water: Clean and free of deleterious matter.

C. Portland Cement: Conform to ASTM C150, Type I or II.

D. Hydrated Lime: Conform to ASTM C207, Type S.

E. Aggregate shall be clean, well graded sand or screenings from crushed stone or slag, and shall conform to ASTM C33 for fine aggregate except that it shall be graded within the following limitations:
1. Passing No. 4 sieve: 100 percent
2. Passing No. 8 sieve: 90 percent
3. Passing No. 16 sieve: 60 percent-90 percent
4. Passing No. 30 sieve: 35 percent-70 percent
5. Passing No. 50 sieve: 10 percent-30 percent
6. Passing No. 100 sieve: 5 percent

F. Bonding Agent: ASTM C31; type recommended for bonding stucco to concrete and concrete masonry.

G. Color: Integral color pigment, custom color as selected by Architect and Resident Engineer, suitable for use in Portland cement plaster.

2.02 SHEATHING AND WEATHER-RESISTIVE BARRIER

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Gypsum Sheathing: Fire-Rated Fiberglass-Mat Faced Gypsum Sheathing conforming to ASTM C1177, Type X:
1. Thickness: 5/8 inch.
2. Width: 4 feet.
3. Length: 8 feet, 9 feet or 10 feet as applicable to project requirements.
4. Weight: 2.5 lb/sq. ft.
5. Edges: Square.
6. Surfacing: Fiberglass mat on face, back, and long edges.
7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 654 pounds per square foot, dry.
8. Flexural Strength, Parallel (ASTM C1177): 100 lbf, parallel.
9. Humidified Deflection (ASTM C1177): Not more than 1/8 inch.
10. Permeance (ASTM E96): Not more than 17 perms.
11. R-Value (ASTM C518): 0.67.
12. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
13. Microbial Resistance (ASTM D6329, GREENGUARD 3-week protocol): Will not support microbial growth.
14. Acceptable Product: 5/8 inch DensGlass Fireguard Sheathing, Georgia-Pacific Gypsum or equal
15. Fasteners: ASTM C1002, corrosion resistant treated screws.

C. Weather Resistive Barrier:
1. Weather resistive barrier composed of either cross-laminated polyolefin films, woven polyolefin strands, or spunbonded polyolefin fibers, coated or uncoated, with or without perforations to transmit water vapor but not liquid water complying with UBC Standard 14-1 or ICC approved alternative:
   a. Thickness: 3 mils minimum.
   b. Water Vapor Transmission: 10 perms minimum as tested per ASTM E96, Procedure A.
   c. Flame Spread: Maximum of 25 per ASTM E84.
   d. Minimum Allowable Exposure: 3 months.
2. Furnish one of the following products, except as approved by the Architect and Resident Engineer, subject to compliance with specification requirements:
   a. Tuff Wrap as manufactured by Celotex www.usg.com
   b. Tyvek CommercialWrap as manufactured by Dupont
   c. Or equal.
3. Fasteners:
   a. Nails: Standard round wire shingle type, hot dipped zinc coated steel, minimum 13/64 inch head diameter, or with plastic washer heads, and 0.080 inch shank diameter, of sufficient length to penetrate into wall studs.
   b. Staples: Standard wide face staples, hot dipped zinc coated steel, minimum 1 inch crown, of sufficient length to penetrate into wall studs.
   . Screws: Steel drill screws with washers complying with ASTM C1002, Type S, hot dipped zinc coated steel, of sufficient length to penetrate steel framing.
4. Sealing Tape: Manufacturers standard pressure sensitive seam sealing of tape of polyolefin film coated with a permanent acrylic adhesive.
5. Joint Sealer:
   a. Polyurethane or latex based joint sealer acceptable or recommended by sheet manufacturer and complying with Section 07 92 00.
   b. If exposed to the interior of the building (i.e., inside of the weatherproofing system and applied on-site), provide materials in accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.
6. Adhesive:
   a. Polyurethane or latex based adhesive acceptable to sheet manufacturer.
   b. If exposed to the interior of the building (i.e., inside of the weatherproofing system and applied on-site), provide materials in accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

2.03 FURRING, LATHING AND ACCESSORIES

A. General:
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Wire Mesh Reinforcement: 2 inch x 2 inch galvanized steel, 24 gauge wire, woven mesh.

C. Metal Lath: 2.5 lb./sq.yd. expanded metal, self-furring type lath complying with ASTM C847; fabricated from galvanized steel sheet complying with ASTM A653, G60.

D. Corner Mesh: Formed steel, minimum 26 gauge; expanded flanges shaped to permit complete embedding in plaster; minimum 2 inches wide; galvanized finish.

E. Corner Beads: Formed steel, minimum 26 gauge; beaded edge, of longest possible length; sized and profiled to suit application; galvanized finish.

F. Base Screeds: Formed steel, minimum 26 gauge; square edge, of longest possible length; sized and profiled to suit application; galvanized finish.

G. Casing Bead: Formed steel; minimum 26 gauge; thickness governed by plaster thickness; maximum possible lengths; expanded metal flanges, with square edges; galvanized finish.

H. Control Joint Accessory: Formed steel; minimum 26 gauge; galvanized finish; accordion profile, 2 inch expanded metal flanges each side; galvanized finish.

I. Expansion Joint Accessory: Formed steel, 26 gauge; accordion profile, 2 inch expanded metal flanges each side; galvanized finish.

J. Flashing Reglets: As specified in Section 07 60 00.

K. Tie wire shall be double annealed and galvanized conforming to Type I FS QQ-W-461, of gauges specified.

L. Anchorages: Nails, staples, or other approved metal supports, of type and size to suit application, galvanized to rigidly secure lath and associated metal accessories in place.

2.04 PROPORTIONING AND MIXING

A. Accurately measure ingredients. Proportion successive batches exactly alike. Mix aggregate, cement and other dry materials until the mass is uniform in color and homogeneous before adding water. Determine the quantity of water necessary for the desired consistency by trial, and thereafter measure in proper proportions. Re-tempering will not be allowed.

B. Mortar for coats shall consist of one volume of portland cement to not less than three or more than five volumes of damp, loose aggregate.

C. Hydrated lime, hydrated lime putty, or slaked lime putty may be added as a plasticizing agent, but the amount used shall not exceed 10 percent by weight nor more than 25 percent by volume of the cement used.

D. Mix materials dry, to uniform color and consistency, before adding water.

E. Mix integral color to provide consistent color for all batches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Preconstruction Conference: A conference shall be held at the jobsite prior to start of construction of this portion of the work to review substrates, flashing conditions, work provided by preceding trades and work required by trades following this work. General Contractor, subcontractor(s) affected by the work of this section, Architect and Resident Engineer and Owner's Representative shall be in attendance. If required, modifications shall be made to details and to specifications to address actual field conditions.

B. Gypsum Sheathing:
1. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.
2. Verify that surface of framing members do not vary more than 1/4 inch from the plane of faces of adjacent members.
3. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

C. Weather Resistive Barrier:
1. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.
2. Verify base, sill and other flashing materials are in place prior to installation of weather resistive barrier.

D. Portland Cement Plaster:
1. Verification of Conditions: Examine subsurfaces and supports to receive Work and report detrimental conditions in writing, with a copy to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces. Verify, before proceeding with this Work that required inspections of existing conditions have been completed.
2. Coordination with other Work: Coordinate with other Work which affects, connects with, or will be concealed by this Work. Before proceeding, make certain required inspections have been made.

3.02 SHEATHING INSTALLATION

A. Gypsum Sheathing: In accordance with GA-253, ASTM C1280 and the manufacturer's recommendations and IBC requirements.
1. Verify that surface of framing members do not vary from more than 1/4 inch from the plane of faces of adjacent members.
2. Panels of the maximum length possible shall be used to minimize the number of joints. Edge joints must be located parallel to and with vertical orientations on framing. End joints of adjacent lengths of sheathing must be staggered.
3. Cut board at penetrations, edges and other obstructions; and fit tightly against abutting construction, unless otherwise indicated.
4. Fasteners must be driven so as to bear tight against and flush with surface of sheathing, but do not cut into facing.. Fasteners must not be countersunk.
5. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
6. Fasteners must be located a minimum of 3/8 inch from edges and ends of sheathing panels.

3.03 WEATHER-RESISTIVE BARRIER/LATHING FOR THIN BRICK VENEER

A. Cover sheathing completely with weather-resistive barrier prior to lathing installation.
1. Apply material horizontally starting at outside corner with bottom aligned with foundation or bottom termination and plumb. Leave 6 to 12 inches of material at corner for overlap. Align stud marks on rolls with framing members of exterior wall.
2. Use material as required to span floor to floor height and lap upper layer over lower layer 6 inches minimum. Lap vertical joints 6 inches minimum.
3. Secure sheet to foundation with continuous bead of joint sealer.

4. Wrap sheet 6 inches minimum around all corners lapped over adjacent sheet and taped.
   a. Fasten to sheathed wood frame construction with staples, large head nails, or plastic washer nails.
   b. Fasten to metal frame construction with steel drill screws with washers.
   c. Attach to masonry surfaces with adhesive.
7. Lap upstanding flashing with 4 inch minimum overlap and secure with adhesive.
8. Tape all seams, window and door penetrations, corners, and torn or damaged areas as recommended by sheet manufacturer and as detailed on Drawings.
9. Completed installation shall be free of holes or breaks.

3.04 LATH AND TRIM INSTALLATION

A. Install underlayment over wood framing and sheathing, and lap 2 inches minimum.

B. Lathing: Comply with ML/SFA 920, and the following:
   1. Install lath with the long dimensions of the sheet across supports and attach to the studs or furring using 18 gauge tie wire, or by nailing or by equivalent attachment spaced at intervals not exceeding 6 inches along such studs or furring members. Make end laps of lath only over supports and stagger end laps in adjacent courses.

C. Metal Trim, Joint Assemblies and Reveals: Securely fasten trim members to maintain their position in accordance with recommended practice.
   1. Install casing beads where stucco terminates against dissimilar materials.
   2. Install reveals and other trim at locations indicated on Drawings.
   3. Control and Expansion Joints: Locate and install control joints at locations indicated on Drawings, but not more than the maximum spacing and panel size recommendations of ASTM C1063 as approved by the Architect and Resident Engineer, and as follows:
      a. Install control joints directly over any expansion or contraction joints in the surface of the underlying construction.
      b. Install control joints directly over joint between changes in substrate materials.
      c. Wall Area: Install control joints in walls to create wall areas of not more than 144 sq. ft. in area and not more than 100 sq. ft. for all ceilings, curves, or angular plaster surfaces.
      d. Joint Spacing: Install control joints at maximum 18 ft spacing in either direction or a length-to-width ratio of 2-1/2 to 1.

3.05 STUCCO APPLICATION

A. Application, General: Comply with ASTM C926, and the following.

B. Apply scratch coat with sufficient pressure so that it is forced through the metal reinforcement and against the backing to form full keys and to embed reinforcement completely. Apply to an approximate thickness of 3/8 inch from the face of the backing. Scratch to provide bond for succeeding coat.

C. Apply brown coat not sooner than 48 hours after the application of the scratch coat. Dampen scratch coat evenly to obtain uniform suction. Apply to an approximate thickness of 3/8 inch. Bring surface to a true, even surface by floating or rodding and leave rough, ready to receive finish coat.

D. Concrete or Masonry Substrates: Apply brown coat directly over concrete or masonry, proportioned as specified above. Dampen surface evenly to obtain uniform suction. Apply to an approximate thickness of 3/8 inch. Bring surface to a true, even surface by floating or rodding, leave rough ready to receive finish coat. Cure for 7 days by keeping moist.

E. Apply finish coat not sooner than 14 days after the application of the preceding coat. Before applying, dampen the surface of the preceding coat evenly to obtain uniform suction. Thickness of the finish coat shall be sufficient to secure the texture specified but in no case less than 1/8 inch and the total thickness of the stucco shall be at least 7/8 inch from the face of the backing. Avoid excessive troweling.

F. When applying the finish, plan Work so entire wall can be completed at one time to eliminate joining marks. If not practical, use a corner, door or window as a breaking point.

G. Finish Coat Texture: Smooth.

H. Temperature shall be 45 degrees F. and rising during application and for 48 hours thereafter.

I. Curing: Keep each coat of stucco damp for at least 48 hours after application; moistening of each coat shall begin as soon as the stucco has hardened sufficiently so as not to be injured. Apply water in a fine fog spray. Avoid soaking the wall. Apply only as much water as can be readily absorbed.

3.06 REPAIRS

A. Remove and replace stucco which has cracks, blisters, pitting, discoloration or other defects.

B. Repairing of defects will be permitted only when approved by the Architect and Resident Engineer.

C. Repairs shall match existing Work.

3.07 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Submit data on gypsum board, joint, finish and accessories.

B. Samples: Submit sample of textured finish prior to application.

C. Reports: Submit fire test report for fire rated assemblies, and acoustical performance test reports for acoustically-rated assemblies.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in Gypsum Board Systems Work with 2 years documented experience and approved by Manufacturer.

B. Regulatory Requirements: Conform to applicable code for fire rated assemblies as shown on the Drawings.

C. Comply with applicable specification recommendations of GA-216 and GA-600 as published by the Gypsum Association.

1.03 DELIVERY, STORAGE AND HANDLING

A. Comply with GA-216 and Manufacturer's directions.

1.04 PROJECT CONDITIONS

A. Physical Requirements for Proper Installation or Application:
1. Maintain temperature of installed gypsum board spaces in range of 55 degrees F. to 90 degrees F. until building is entirely closed.
2. Ventilate as required to eliminate excessive moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following Manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with Specification requirements:
1. G-P Gypsum www.gp.com/gypsum/
2. Gold Bond Building Products Div., National Gypsum Co. www.nationalgypsum.com
3. United States Gypsum Co. www.usg.com
4. BPB Gypsum (formerly James Hardie Gypsum) www.us.bpb-na.com
5. Pabco Gypsum www.pabcogypsum.com
6. Or equal.

2.02 MATERIALS AND ACCESSORIES - GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
   1. Paper: 100% post-consumer recycled content
   2. Synthetic gypsum: Gypsum board to be made with flue-gas-desulfurization (synthetic) gypsum if such a product is available locally

B. Provide regional materials in accordance with Regional Materials provisions of Section 01 60 00.

2.03 GYPSUM BOARD MATERIALS

A. Fire Rated Gypsum Board:
   1. Toilet room walls and apparatus room walls (for painted wall finish): USG Fiberock, thickness as indicated on Drawings, in accordance with UL Design U419, or approved equal.
   2. Other locations: ANSI/ASTM C36 or ASTM C1396; fire resistive type, UL rated; 5/8 inch, maximum permissible length; ends square cut, tapered edges.

B. Moisture Resistant Gypsum Board: ANSI/ASTM C630 or ASTM C1396; 5/8 inch thick, maximum permissible length; ends square cut above tile wainscot in toilet rooms for painted finish.

C. Exterior Gypsum Sheathing Board:
   1. As exterior sheathing: In accordance with Sections 04 21 33 – Thin Brick Veneer, 07 42 43.13 - Solid Composite Exterior Wall Panel Systems and 09 24 00 – Portland Cement Plaster (Stucco).
   2. As exterior soffit panel: In accordance with Section 09 29 13 – Exterior Soffit Panels.

D. Cementitious Backer Units (Ceramic Tile Backer Board): Provide cementitious backer units conforming to ANSI A118.9. Georgia-Pacific Dens-Shield, Modulars Inc. Wonder-Board, or USG Durabond Division Durock Tile Backer Board are acceptable products. Furnish with joint tape.

2.04 ACCESSORIES

A. Adhesive:
   1. ASTM C557.
   2. In accordance with the low-emitting materials requirements of Section 01 60 00 – Product Requirements.

B. Acoustical Sealant: In accordance with Section 07 92 20 – Acoustical Sealant.

C. Corner Beads: GA216; Type CB; electro-galvanized steel.

D. Edge Trim: GA216; Type L bead; electro-galvanized steel and Type LC rolled-formed zinc.

E. Control Joint: U.S. Gypsum No. 093, roll-formed zinc.

F. Joint Materials: ANSI/ASTM C475; reinforcing tape, joint compound, adhesive, water, and fasteners. For coated board and gypsum sheathing, use material recommended by Board Manufacturer.

G. Screws: ASTM C1002 for steel drill screws. Type G for fastening to gypsum board, Type S for fastening to light gauge steel framing and Type W for fastening to wood framing.

H. Wall Texture: As manufactured by USG or equal, multi-purpose, pre-packaged, non-asbestos type.

I. Drywall Primer:
1. Paint material specifically formulated to fill the pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads and accessories and over skim coatings.
2. Drywall primer which is applied to the finished surface of the work specified in this section shall be provided as specified under Section 09 91 00 as applicable.
3. A good quality, white latex drywall primer formulated with high binder solids, applied undiluted, shall be applied to gypsum board surfaces prior to the application of texture materials.
4. In accordance with the low-emitting materials requirements of Section 01 60 00 – Product Requirements.

J. Putty Pads: Acoustical Molding Seal at gypsum board at J-Boxes.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that site conditions are ready to receive Work and opening dimensions are as instructed by the Manufacturer.

B. Beginning of installation means acceptance of substrate.

3.02 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with GA-201 and GA-216, and Manufacturer's instructions as applicable.

B. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.

D. Ceiling Boards:
1. Install gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

E. Use screws when fastening gypsum board to metal and wood furring or framing.

F. Double Layer Applications:
1. Use gypsum backing board for first layer, placed perpendicular to framing or furring members.
2. Use fire rated gypsum backing board for fire rated partitions.
3. Place second layer perpendicular to first layer.
4. Offset joints of second layer from joints of first layer.
5. Secure second layer to first with adhesive and sufficient support to hold in place. Apply adhesive in accordance with Manufacturer's instructions.

G. Treat cut edges and holes in moisture resistant gypsum board with sealant.

H. Place control joints consistent with lines of building spaces as indicated on Drawings and as recommended by Board Manufacturer.

I. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

3.03 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

C. Taping, filling, and sanding is not required at surfaces behind ceramic tile..

3.04 ACOUSTICAL TREATMENT

A. Install acoustical sealant in accordance with Manufacturer's instructions and in accordance with Section 07 92 20.

B. Install acoustical sealant at gypsum board perimeter at:
1. Metal framing: Two beads.
2. Base layer of double layer applications, if applicable.
3. Face layer.
4. Caulk partition penetrations by conduit, pipe, ductwork, and rough-in boxes.

C. Install acoustical sealant where gypsum board joins other walls or surfaces at sound control partitions.

D. Install putty pads at all J-Boxes wall cavities prior to installation of final gypsum board surfacing.

3.05 FINISHING OF GYPSUM BOARD SURFACES

A. Provide finish of gypsum board surfaces in accordance with the Gypsum Association "Recommended Specification: Levels of Gypsum Board Finish" as follows:
1. Level 0 (Temporary Construction): No taping, finishing, or accessories required.
2. Level 1 (Fire Taping at plenum areas above ceiling, in attics, in areas where the assembly will be concealed or in building service corridors and other areas not normally open to public view):
a. Joints and interior angles shall have tape embedded in joint compound.
b. Surface shall be free of excess joint compound.
c. Tool marks and ridges are acceptable.
3. Level 2: Not applicable.

4. Level 3 (Appearance areas to receive heavy or medium texture (spray or hand applied) finishes before final painting, or where heavy grade wallcoverings are to be applied as final decoration. This level of finish is not to be used where smooth painted surface or light to medium wallcoverings are to be applied.):
   a. Joints and interior angles shall have tape embedded in joint compound and one additional coat of joint compound applied over joints and interior angles.
   b. Fastener heads and accessories shall be covered with 2 separate coats of joint compound.
   c. Joint compound shall be smooth and free of tool marks and ridges.
   d. Surface to be coated with Drywall Primer as specified herein prior to application of texture.
   e. Untextured surfaces to be coated with Drywall Primer prior to application of final finishes as specified in Section 09 91 00, as applicable.
5. Level 4 (To be provided at locations as scheduled on Drawings):
   a. Joints and interior angles shall have tape embedded in joint compound and 2 separate coats of joint compound applied over flat joints and one separate coat of joint compound applied over interior angles.
   b. Fastener heads and accessories shall be covered with 3 separate coats of joint compound..
   c. Joint compound shall be smooth and free of tool marks and ridges.
   d. Surface to be coated with Drywall Primer as specified herein prior to application of texture.
   e. Untextured surfaces to be coated with Drywall Primer prior to application of final finishes as specified in Section 09 91 00, as applicable.
6. Level 5 (To be provided at Public Areas as scheduled on Drawings):
   a. Joints and interior angles shall have tape embedded in joint compound and 2 separate coats of joint compound applied over flat joints and one separate coat applied over interior angles.
   b. Fastener heads and accessories shall be covered with 3 separate coats of joint compound.
   c. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface to fill imperfections in the joint work, smooth the paper texture and provide a uniform surface for decorating. Excess compound shall be immediately sheared off, leaving a film of skim coating compound completely covering the paper.
   d. The surface shall be smooth and free of tool marks and ridges.
   e. Surface to be coated with Drywall Primer as specified herein prior to application of texture.
   f. Untextured surfaces to be coated with Drywall Primer prior to application of final finishes as specified in Section 09 91 00, as applicable.

B. Surfaces shall be free of dust, dirt and oil and shall received Drywall Primer before application of texture or skim coat as required by the manufacturer of the texture or skim coat materials.

C. Surface Finish: Produce smooth surface finish to match approved sample.

D. Stagger joints of gypsum board on opposite sides of walls at dorm rooms and toilet rooms so as to minimize unwanted sound transfer for minimum STC ratings.

3.06 CLEANING

A. After completion of wallboard installation, taping and texturing, remove rubbish, excess material and equipment from building and job site, leaving floors and other surfaces clean.

B. Remove overspray from adjoining construction.

C. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

D. Construction Waste: In accordance with Section 01 74 19 .

E. Water Pollution Control: In accordance with Greenbook/Whitebook requirements.

F. Storm Water Control: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

G. Environment Protection: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

3.07 PROTECTION

A. Protect Work from damage until acceptance.

B. Repair or replace damaged Work.

END OF SECTION

SECTION 09 29 13

EXTERIOR SOFFIT PANELS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Water-resistant gypsum sheathing for exterior soffit panel as shown on Drawings and as specified herein.

B. Related Sections:
1. Section 04 21 33 – Thin Brick Veneer: Brick veneer over fiberglass faced gypsum sheathing panels.
2. Section 05 41 00 - Load-Bearing Metal Stud System: Metal Framing at exterior wall and soffit construction.
3. Section 07 42 43.13 - Solid Composite Exterior Wall Panel Systems: Exterior panel dry system over fiberglass faced gypsum sheathing panels.
3. Section 09 24 00 – Portland Cement Plaster (Stucco): Stucco over fiberglass faced gypsum sheathing panels.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, design data and installation instructions.

B. Contract Closeout Submittals: Submit Manufacturer's standard warranty in accordance with Section 01 77 00 - Closeout Procedures and as specified herein.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Comply with applicable specification recommendations of GA-216 and GA-600 as published by the Gypsum Association.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.

B. Storage: Store panels flat in an enclosed shelter providing protection from damage and exposure to the elements.

1.05 WARRANTY

A. Furnish Manufacturer's standard 10 year limited warranty covering defects in manufacturing and materials and minimum 6 month exposure warranty stating that product will remain free of defects and suitable for its intended use after installation, but before the exterior weather-resistive barrier or cladding is installed on the building, regardless of exposure to normal weather conditions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
   1. Paper: 100% post-consumer recycled content
   2. Synthetic gypsum: Gypsum board to be made with flue-gas-desulfurization (synthetic) gypsum if such a product is available locally

B. Provide regional materials in accordance with Regional Materials provisions of Section 01 60 00.

C. Glass Matt Exterior Sheathing Board: Dens-Glass Sheathing complying with ASTM C1177 as manufactured by G-P Gypsum Corporation.
   1. Thickness: 5/8 inch.
   2. Acceptable alternative manufacturers and products:
      a. CertainTeed GlasRoc
      b. US Gypsum SecurRock
      c. Temple-Inland Greenglass
      d. Or equal.

2.02 ACCESSORIES

A. Fasteners: Type S-12, bugle head, self-tapping, with organic-polymer or other protective coating, fine thread for heavy gauge steel (12 to 22), or steel type Exterior Screws as manufactured by USG or equal.
   1. Length: As recommended to penetrate metal framing minimum depth as recommended by sheathing manufacturer.
   2. Additional requirements for Fasteners used for exterior gypsum sheathing at Exterior Insulation Finish (EIFS):
      a. Corrosion resistant, with anti-corrosive coating capable of withstanding no more than 5 percent red rust after 500 hours of Salt Spray Tests in accordance with ASTM B117.
      b. Size and type as used in wind load tests

B. Reveal Molding: Fry Reglet Veneer Plaster “F” Reveal Molding or equal, sizes as indicated on Drawings with “Snap-in” Reveal (width as applicable to reveal width shown), 6063-T5 extruded aluminum alloy with clear anodized finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Verify that surface of framing members do not vary more than 1/4 inch from the plane of faces of adjacent members.

C. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Glass Matt Exterior Sheathing Board:
1. Install in accordance with manufacturer's printed instructions. Yellow side of sheathing shall face to the exterior with the white face facing the interior of the building.
2. Verify that surface of framing members do not vary from more than 1/4 inch from the plane of faces of adjacent members.
3. End joints shall be offset. Joints should fit snugly and flashing installed around openings.
4. Panels of the maximum length possible shall be used to minimize the number of joints. Edge joints must be located parallel to and with vertical orientations on framing. End joints of adjacent lengths of sheathing must be staggered.
5. Attach sheathing to metal framing with screws spaced 8 inches o.c. at perimeter and 8 inches o.c. in field, unless otherwise required to meet wind load requirements.
6. Fasteners must be driven so as to bear tight against and flush with surface of sheathing. Fasteners must not be countersunk.
7. Fasteners must be located a minimum of 3/8 inch from edges and ends of sheathing panels.
8. Sealing Sheathing Joints: Seal joints according to sheathing manufacturer's written recommendations and as follows:
   a. Apply 2-inch self-adhering glass-fiber sheathing tape to glass-mat gypsum sheathing board joints overlapping at intersections by width of tape.
   b. Apply 3/8 inch bead of silicone emulsion sealant along the joint and trowel embed sealant into entire face of tape.
   c. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.
9. Where a smooth finished surface is indicated, apply joint tape over joints and embed in setting type joint compound. Skim coat entire surface with setting type joint compound for smooth finish.
10. Provide reveal moldings where indicated on Drawings.

3.03 CLEANING

A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 09 30 00

TILE

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Submit Manufacturer's data for tile and accessory materials, including the following
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Recommended procedures for mixing materials and setting tile.

B. Samples: Submit samples of each type of ceramic tile required, marked with Manufacturer's name and location where tile is to be installed.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 QUALITY ASSURANCE

A. Comply with applicable requirements of ANSI A-108 Series and the TCA "Handbook for Ceramic Tile Installation." Tile shall bear the TCA grade seal. In addition, comply with applicable requirements of the Technical Field Reports and other documentation as provided by the Ceramic Tile Instituite (CTI).

B. Manufacturer Qualifications: Company specializing in manufacturing the products of this section with minimum 2 years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum 2 years documented experience.

D. Pre-Installation Meeting: Prior to commencing the work of this Section, schedule and attend a meeting at the job site to discuss conformance with Project requirements. Conduct Pre installation conference at project site to view existing concrete slab prior to installation of leveling compound, mortar , or crack isolation membrane. Notify 72 hours in advance and Include manufacturers product rep, subcontractor, general contractor, owner rep, Architect and Resident Engineer. Do not install products on unsatisfactory substrate.

F. Mock-ups: Provide job site mock-ups which will be used as data for comparison with the remainder of the work of this Section for the purposes of acceptance or rejection. Mockup shall allow evaluation of surface preparation techniques and application workmanship if required by Architect and Resident Engineer.
   1. Locate mock-ups on site in locations and size directed by Architect and Resident Engineer.
   2 Finish areas designated by Architect and Resident Engineer.
   3. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect and Resident Engineer.
   4. Refinish mock-up area as required to produce acceptable work.
   5. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of Work.

6. Obtain Architect's and Resident Engineer's acceptance of mock-ups before start of final unit of Work.

G. Blending:
1. Tile manufacturer to blend tile at the factory.
2. Provide additional blending at the job site as needed to obtain the Architect's and Resident Engineer's approval.

H. Regulatory Requirements: Provide floor tiles with coefficient of friction in accordance with ADA guidelines.

1.03 DELIVERY, STORAGE AND HANDLING

A. Deliver manufactured materials in original, unbroken containers bearing name of Manufacturer, brand and grade seals. Keep materials dry, clean and protected against deterioration. Comply with requirements of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter and other causes.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.04 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Environmental: Install mortar, set and grout tile when surfaces and ambient temperature is minimum 50 degrees F (10 degrees C) and maximum 90 degrees F (32 degrees C). Consult with manufacturer for specific requirements.

C. Protection: Protect adjacent work surfaces during tile work. Close rooms or spaces to traffic of all types until mortar and grout has set.

1.05 WARRANTY

A. Products shall be provided with the manufacturers standard warranty as follows:
1. Installation Systems Limited Warranty: Fifteen (15) Year Warranty.

1.06 MAINTENANCE

A. Extra Materials: Furnish one (1) square foot of tile for each 100 square feet of each color and size of tile and grouting materials used in the Project. If less than 100 square feet is installed, provide a minimum of one square foot of extra stock. Extra materials shall be furnished in original packaging.

PART 2 PRODUCTS

2.01 MATERIALS AND ACCESSORIES - GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Provide regional materials in accordance with Regional Materials provisions of Section 01 60 00.

2.02 TILE MATERIALS

A. General: See Color Schedule as released by Architect and Resident Engineer for bidding purposes

B. Porcelain Tile Floor: 12 inch by 12 inch, manufacturer and product as selected by Architect and Resident Engineer or equal.

C. Ceramic Tile
1. Toilet/Shower Wall (Field): 2 inch by 2 inch, manufacturer and product as selected by Architect and Resident Engineer or equal.
2. Toilet/Shower Wall (Accent): 2 inch by 2 inch, manufacturer and product as selected by Architect and Resident Engineer or equal.
3. Toilet/Shower Floor: 2 inch by 2 inch (unglazed), manufacturer and product as selected by Architect and Resident Engineer or equal. Cove base to match floor
4. Apparatus Wall (Field): 4-1/4 inch by 4-1/4 inch, manufacturer and product as selected by Architect and Resident Engineer or equal.

2.03 INSTALLATION MATERIALS

A. Skim Coat and Patching Underlayments: Where indicated on the drawings, and elsewhere as required to existing mortar bed providing a flat, level surface for direct receipt of tile and other floor coverings on dry, interior installations.
1. Custom Building Products Skim Coat and Patching Cement Underlayment or equal for fills up to 1/2 inch (12.5 mm) thick.
2. Custom Building Products LevelQuik Rapid Setting Self-Leveling Underlayment or equal for fills up to 1 inch (25 mm) thick.
   a. Custom LevelQuick Latex Primer or equal; Prepares surfaces for LevelQuik Rapid Setting Self-Leveling Underlayment.

B. Anti-Fracture Membrane/Cleavage Membrane: Where indicated on the drawings, and elsewhere as required for isolating the installation from cracking due to minor substrate movement and normal structural deflections.
1. Custom Building Products Crack Buster Pro Crack Prevention Mat Underlayment or equal
   a. Custom Peal & Stick Primer or equal; Prepares surfaces for peel & stick adhesive underlayment.

C. Cementitious Tile Adhesives: ANSI A118.4: Polymer-Enhanced Mortars:
1. Tile adhesive requires a minimum “Shear Bond” strength after 28 days of 450 PSI for bisque tile and 600 PSI for porcelain tile. .
2. Custom Building Products ProLite Thin Set and Medium Bed Mortar or equal.

D. Cement Based Grout: Where indicated on the drawings, and elsewhere as required for filling the joints between tiles.
   1. Polymer-Modified Portland Cement Grout:
   2. Tile grout requires a minimum "Tensile Strength" after 28 days of 500 PSI.
   3. Acceptable Product: Custom Building Products Prism SureColor Tile Grout or equal, ANSI A118.7 for joints 1/8 inch (3 mm) to 1/2 inch (13 mm).
   4. Grout Sealer: As recommended by grout manufacturer.

2.05 ACCESSORIES

A. Ceramic Tile Backer Board: As specified in Section 09 29 00. Furnish with joint tape.

B. Expansion/Control Joint Backing Material: Provide closed cell polyethylene foam weighing not less than 2.7 lbs. per cubic feet, and in dimension approximately 20 percent thicker than width of the expansion joint in which used.

C. Expansion/Control Joint Sealant: Provide in colors selected by the Architect and Resident Engineer, complying with requirements of Section 07 92 00.
   1. At joints between floors and walls, and at perimeter of metal door frames, provide one-part low modulus moisture cure silicone rubber sealant conforming to FS TT-S-001543A, Class A, FS TT-S-00230C, Type II, Class A and ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, G, A, and O.
   2. At joints in traffic areas, and at perimeter joints, provide two-part polyurethane material conforming to ASTM C920, Type M, Grade P, Class 25, Use T, with Shore A hardness of 35 - 45 .
   3. Sealants shall be in accordance with the low-emitting materials requirements of Section 01 60 0 – Product Requirements.

D. Waterproof Membrane (2nd and 3rd floor toilet and shower rooms): Provide one of the following:
   1. PRP 315 two-component synthetic polymer anti-fracture and waterproofing membrane and as manufactured by Mapei Corporation or equal, meeting ANSI A118.10, trowel-applied
   2. Schluter KERDI sheet waterproofing membrane or equal.
   3. Other sheet waterproofing membrane meeting Uniform Plumbing Code and so labeled and acceptable to Architect and Resident Engineer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine subsurfaces to receive Work and report detrimental conditions in writing. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordinate with other Work which affects, connects with or is concealed by this Work. Before proceeding, make certain required inspections have been made.

C. Where tile units will be thin-set directly to the substrata, do not commence installation of the tile units until substrata are within the following tolerances:
   1. Horizontal surfaces: Level within 1/8 inch in ten feet in all directions;
   2. Vertical surfaces: Level within 1/8 inch in eight feet in all directions.

3. Deflection:
   a. Horizontal Surfaces: Less than 1/360 of the span.
   b. Vertical Surfaces: Verify that design of the wall or partition will not permit deflection exceeding 1/360 of the span for point and uniform loading. Space wood or metal studs not less than 16 inches on centers.

D. Conditions of Surfaces to Receive Tile:
1. Verify that surfaces to receive tile are firm, dry clean, and free from oily or waxy films and curing compounds.
2. Verify that grounds, anchors, plugs, recess frames, bucks, electrical work, mechanical work, and similar items in or behind the tile have been installed before proceeding with installation of tile.
3. Scarify hard steel trowel finish concrete surfaces.
4. Completely remove curing compounds on concrete surfaces by scarification or cleaning methods acceptable to tile setting materials manufacturer.

3.02 PREPARATION

A. Lay out Work so that no tile of less than half size occurs.
1. For heights stated in feet and inches, maintain full courses to produce nearest attainable heights without cutting tile.
2. Align joints in wall tile vertically and horizontally except where other patterns are shown or specified. Align joints in walls to conform to patterns selected.
3. Align joints in floor tile at right angles to each other and straight with walls and conform to patterns selected or indicated.

B. Obtain exact locations of expansion joints and accessories before installing tile. Locate accessories in tile walls as indicated on Drawings or as directed by Architect and Resident Engineer. Where the size of accessory does not line up with the jointing pattern of adjacent tile, the cutting of tile and arrangement of joints around the accessories shall be as directed by Architect and Resident Engineer.

C. Surface Preparation for Tile Work.
1. General:
   a. All supporting surfaces shall be structurally sound, solid, stable, level, plumb, and true to a tolerance in plane of 1/4 inch (6 mm) in 10 feet 0 inch (3 m) for walls, 1/4 inch (6 mm) in 10 feet (3 m) for floors when specified for thin-set method. They shall be clean and free of dust, oil, grease paint, tar, wax, curing compound, primer, sealer, form release agent, laitance, loosely bonded topping, loose particles or any deleterious substance and debris which may prevent or reduce adhesion.
   b. Mechanically sand and scarify the substrate to completely remove all paint, loosely bonded topping, loose particles and construction debris.
   c. Neutralize any trace of strong acid or alkali.
   d. All substrates shall be dry. The moisture content shall not exceed 50 percent.
   e. Turn off all forced ventilation and radiant heating systems and protect work against drafts during installation and for a period of at least 72 hours after completion. Use indirect auxiliary heaters to maintain the temperatures in the area at the recommended workable level. Vent temporary heater to exterior to prevent damage to tile work from carbon dioxide build-up.

f. Presswood, particleboard, chipboard, masonite, gypsum floor patching compounds, asbestos board, Luan and similar dimensionally unstable materials are not acceptable substrates. Before work commences examine the areas to be covered and report any flaw or adverse condition in writing to the Architect and Resident Engineer and to the general contractor. Do not proceed with work until surfaces and conditions comply with the requirements indicated in ANSI A108 specifications.

2. Concrete:
   a. All concrete substrates shall be at least 28 days old, completely cured and free of hydrostatic conditions, and/or moisture problems.
   b. New concrete surfaces for dry-set mortar, medium-bed mortar or thick-bed mortar installations shall be wood floated or broom finished. Concrete walls should be bush-hammered or heavily sandblasted.
   c. On grade or below grade concrete slabs must be installed over an effective vapor barrier and be exempt from hydrostatic pressures.
   d. Over excessively dry porous concrete, keep the concrete substrate continuously moist for at least 24 hours before work begins when using dry-set mortars or medium-bed mortars. Remove all excess water or standing water allowing the surface to become almost dry before installing the leveling coat, dry-set mortar or medium-bed dry-set mortar.
   e. For minor repairs and smoothing up to 1/2 inch (12 mm), use Skim Coat & Patch Cement Underlayment or SpeedFinish Patching & Finishing Compound.
   f. For leveling of large areas use LevelLite Self-Leveling Underlayment for pours up to 2 inches (51 mm) thick, LevelQuik Rapid Setting Self-Leveling Underlayment for pours up to 1 inch (25 mm) thick or Extended Setting Self-Leveling Underlayment for pours up to 1 inch (25 mm) thick.

3.03 INSTALLATION

A. Ceramic Tile Backer Board: Install full height (including ceramic tile wainscot locations) at restroom and apparatus walls indicated on Drawings in accordance with Manufacturer's directions and as specified in Section 09 29 00.

B. Skim Coat and Patching Underlayment:
   1. Dampen existing mortar bed.
   2. Force material into all cracks and voids up to 1/2" (13 mm) thickness using a broad knife or trowel and finish flush with surface.
   3. For skim coating, use a smooth edged trowel to level the surface area. Only spot patching should be done on wood surfaces.
   4. If a leveling layer over 5 ft. (1.5 m) in diameter is required, use the LevelQuik Self-Leveling Underlayment.

C. Anti-Fracture Membrane Application:
   1. Apply with a paint brush or short nap roller. Apply a thin, even coat and allow to dry to a clear film before applying anti-fracture membrane.
   2. With the release sheet still attached, pre-measure and cut membrane to desired length. Membrane should extend 6" to 8" (15 – 20 cm) beyond the length of the crack in both directions and extend beyond both sides of the crack a minimum of the diagonal measurement of the tile.
   3. Re-roll membrane and center over the crack. Remove about 2" (5 cm) of release paper and apply firmly to the substrate. Pull off the rest of the release paper exposing and unrolling the self-stick portion of the membrane.
   4. Secure membrane to the substrate by rolling with a 50 lb. (26 kg) roller or 50 lb. of heavy pressure from a hand roller or flat trowel.

D. Setting Materials:
1. Specified setting materials may be installed up to 3/4 of an inch thick on horizontal surfaces.
2. Apply mortar or adhesive with notched trowel using scraping motion to work material into good contact with the wall surface to be covered. Maintain 95 percent coverage on back of Tile and fully bed all corners.
3. When installing natural stone Tiles, trowel a sufficient quantity of mortar adhesive onto back of each Tile.
4. Maintain 95 percent coverage on back of the Tile and fully bed all corners.
5. Apply only as much mortar or adhesive as can be covered within allowable windows as recommended by mortar or adhesive manufacturer or while surface is still tacky.
6. Set Tiles in place and rub or beat with small beating block.
7. Lightly beat or rap Tile to ensure proper bond and also to level surface of Tile.
8. The setting materials must be free of voids to create a continuous, solid bond.
9. Align Tile to show uniform joints and allow for setting until firm.
10. Clean excess mortar or adhesive from surface of Tile with wet cheesecloth while mortar is fresh.

E. Tile: The current edition of the "TCNA Handbook for Ceramic, Glass and Stone Tile Installation" as published by the Tile Council of North America, Inc. is incorporated by reference into this Specification and is to be used as the primary guide for tile installation, unless noted otherwise.
1. Comply with the following installation methods:
   a. F113 for dry floors on concrete at grade.
   b. F113a for dry room floors on concrete above grade.
   c. B414 and F121 for wet floors on concrete at grade and above grade.
   d. W243 for dry walls
   e. W244 for semi wet walls (apparatus bay, drying area, behind urinals and toilet fixtures).
   f. B414 and W231/W241 for wet walls (shower, etc.)
2. In addition, install tile in accordance with ANSI Specifications A108.1 through A118.1 and Manufacturer's recommendations. Masonry walls to receive tile shall have a leveling coat of mortar applied prior to installation of tile.
3. Cut and drill neatly as required without marring tile. Rub smooth necessary cuts with a fine stone. Set cut edge against fixture, cabinet or other tile with joint at least 1/16-inch wide.

F. Grout Application:
1. Installation to conform to ANSI A108.10. Lightly dampen absorptive, highly porous tile with clean, cool water but leave no standing water in the joints. Holding a rubber grout float at a 45° angle to the tile surface, force grout diagonally into joints ensuring joints are completely filled. Remove excess grout using edge of float held at a 90 angle.
2. Spread no more grout than can be cleaned in 30 minutes from the time the grout begins to firm. Clean-up can begin when grout begins to firm, typically 10 - 30 minutes, depending on the type of tile and ambient temperature. Use as little water as possible for grout cleanup.
3. Smooth and level joints and remove excess grout from tile with a damp (not wet) small pore (hydrophilic) grout sponge using a circular motion. Change water and rinse sponge frequently. Haze can be removed after as little as 3 hours with cheesecloth or a wrung-out sponge.
4. Finished surface of joints shall be uniformly smooth, and continuously level with edges of tile.

G. Expansion joints, control joints, insulation joints, etc., must be located in compliance with TCA EJ171 and filled with appropriate materials.
1. Joints must be carried through all layers of installation materials including tile, setting bed, mortar bed and reinforcing wire. Joints should be every 20 to 25 feet (6.1 to 7.3 m) in both directions for interior installations and 8 to 12 feet (2.4 to 3.6 m) in both directions for exterior installations. (Refer to TCA Handbook, EJ171 and ANSI AN-3.8 for details on placement, size and specifications of materials.) .
2. Workmanship for caulking and sealants shall conform to requirements of Section 07 92 00.
3. Joints between tile and door frames and other metal accessories, tile and ceiling, wall tile and wall tile at inside corners and wall tile and floor tile shall be sealed with silicone rubber sealant.
4. Provide expansion joints at tile columns, curbs and pipes and fill with sealant. At building structural joints extend expansion joints through the tile. Seal with sealant. In no case shall tile be carried over expansion joints without a joint in the tile.

3.04 GROUT CURING AND SEALING

A. Damp cure all tile installations, including Portland cement grouts, for 72 hours minimum.
1. Cover with clean non-staining 40-pound Kraft paper.
2. Do not use polyethylene sheets directly over tile on horizontal surfaces.
3. Keep all traffic off newly installed floors for at least 72 hours. Protection may be necessary.

B. Seal grout in accordance with manufacturer's recommendations.

3.05 TOLERANCES

A. Tile: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignments shown:
1. Horizontal surfaces: 1/8 inch in 10’-0” in all directions;
2. Vertical surfaces: 1/8 inch in 8’-0” in all directions.
3. Lippage: 1/8 inch maximum.
4. Maximum Variation of Joint Width: 1/16 inch.

3.06 CLEANING

A. Wipe surfaces clean after grouting, remove traces of mortar and grout. Do not use acid solution for cleaning glazed tile.

B. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

C. Construction Waste: In accordance with Section 01 74 19 .

3.07 PROTECTION

A. Close spaces to traffic or other Work until tile is firmly set. Protect from damage until acceptance. Repair damaged Work at no additional cost to Owner.

B. Prohibit foot and wheel traffic from using newly tiled floors for at least 7 days. Place large, flat boards in walkways and wheelways where use of newly tiled floor is unavoidable.

END OF SECTION

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings: Submit Drawings showing complete layout of systems including attachments, intersections of members, seismic bracing, and edge conditions.

B. Product Data: Provide data on metal grid system components and acoustical units.

C. Samples:
1. Submit 2 samples of each type of unit specified, including color selection when applicable.
2. Submit samples of Manufacturer's full color selection for selection by Architect and Resident Engineer.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 QUALITY ASSURANCE

A. Qualifications: Minimum of 2 years successful installation experience with manufacturer's specified products.

B. Standards: Comply with the following:
1. ASTM C635, "Standard Specification for Acoustical Tile and Lay-In Panel Ceilings."
2. ASTM C636, "Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels."
3. Ceilings and Interior Systems Construction Association (CISCA) "Recommendations for Direct-Hung Acoustical tile and Lay-in Panel Ceilings."

1.03 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

1.04 MAINTENANCE

A. Extra Materials: Provide an additional 5 percent of each type of acoustical unit installed, in unopened labeled cartons, to the Owner at completion of Work, for his maintenance use, at no additional cost. Provide, at minimum, one full carton of each type of acoustical unit.

PART 2 PRODUCTS

2.01 MATERIALS AND ACCESSORIES - GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Provide regional materials in accordance with Regional Materials provisions of Section 01 60 00.

2.02 SUSPENSION SYSTEM

A. Ceiling Suspension System: Heavy duty (to meet seismic standards) with components formed from commercial quality cold rolled steel electro-zinc coated to comply with ceiling tile edge.
   1. Main-Runners: Minimum of 1-1/2 inch in height with an exposed capped face of 15/16 or 9/16 inch in width (as applicable for specified tile), nominally 12 feet long.
   2. Cross-Tees: Minimum of 1-1/2 inch in height with an exposed capped face in a width to match main runners.
   3. Finish: Exposed faces of main and cross runners shall be a baked enamel paint finish, white color.
   4. Suspension system shall support the ceiling system specified with a maximum deflection of 1/360 of the span.

B. Hanger Wire: Galvanized steel conforming to Federal Specification FF-QQ-W-461, Finish 5, Class 1 annealed, and not less than 12 gage).

C. Wall and Penetration Moldings: 24 MSG painted steel with a minimum one inch wide lower flange, finish and configuration to match grid. For circular penetrations provide edge molding manufactured to exact diameter of circular penetration.

D. Hold-Down Clips: Provide access type hold-down clips where required by Acoustical Ceiling Manufacturer for type and condition and where panels weigh less than one pound per square foot.

E. Seismic bracing and compression struts: As required to meet seismic requirements as noted on General Structural Notes.

2.03 CEILING PANELS

A. Acoustical Ceiling Panel: Eclipse Clima Plus 2'-0" by 2'-0" by 3/4 inch by USG or equal (white color).

2.04 ACCESSORIES

A. Acoustical Batt Insulation: Specified in Section 09 81 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing, with a copy to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Verify, before proceeding with this Work, that required inspections of existing conditions have been completed.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636 and as supplemented in this Section. Design and construct system as required to meet seismic requirements as noted on General Structural Notes.

B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

C. Locate system on room axis according to reflected ceiling plan.

D. Install after major above-ceiling Work is complete. Coordinate the location of hangers with other Work.

E. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

F. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.

I. Do not eccentrically load system, or produce rotation of runners.

J. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

K. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

3.03 INSTALLATION - ACOUSTICAL LAY-IN UNITS

A. Install acoustical units in accordance with Manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling Work is complete.

E. Install acoustical units level in uniform plane, and free from twist, warp and dents.

F. Cut panels to fit irregular grid and perimeter edge trim. Field rabbett panel edge. Double cut and field paint exposed edges of reveal edge units.

G. Where round obstructions occur, provide preformed closers to match edge molding.

H. Install hold-down clips to retain panels tight to grid system where required.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/4 inch in 10 feet.

3.05 ADJUSTING

A. Remove damaged or soiled panels and replace with new units, as directed by Architect and Resident Engineer.

3.06 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19 .

END OF SECTION

SECTION 09 65 19

RESILIENT FLOORING

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Submit data on specific products, describing physical and performance characteristics, sizes, patterns and colors available.

B. Samples: Submit 2 samples of each material specified illustrating color and pattern.

C. Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 QUALITY ASSURANCE

A. Qualifications: Minimum of 2 years successful installation experience with manufacturer's specified products.

B. Regulatory Requirements:
1. Critical Radiant Flux Classification: Class I (Not less than 0.45 Watts per sq./cm per ASTM E648).
2. Slip resistance of floor surfaces and changes in level shall be in accordance with applicable law.

1.03 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

1.04 PROJECT/SITE CONDITIONS

A. Physical Requirements for Proper Installation or Application: Installation shall not begin until Work of other Trades is substantially completed and the area or rooms where flooring is to be installed has been maintained at a minimum temperature of 70 degrees F. for at least 48 hours.

B. Moisture content and bondability of concrete sub-floors shall be determined by a field testing method recommended by the flooring manufacturer.

C. Maintain ambient temperature required by Adhesive Manufacturer three days prior to, during, and 24 hours after installation of materials.

1.05 MAINTENANCE

A. Extra Materials: Provide 50 square feet of flooring and 50 lineal feet of base of each material specified.

PART 2 PRODUCTS

2.01 MATERIALS AND ACCESSORIES - GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Provide low-emitting materials in accordance with Section 01 60 00 for flooring materials.

C. Flooring shall comply with the requirements of CALGreen 5.504.4.6

2.02 TILE FLOORING

A. Solid Vinyl Tile:
1. Manufacturer: Armstrong Commercial Flooring or equal
2. Size: 6 inch by 36 inch tile
3. Series: Natural Creation
4. Style: Mystix
5. Color: TP779 sideline gray beige.

B. Weight Room Tile: Tuflex by Roppe or equal.
1. Size: 27 inch by 27 inch by 1/4 inch thick
2. Color: “Rouge” #934

2.04 BASE

A. Rubber or Vinyl Base: 4 inch high by Burke, Armstrong or equal. Color(s) to be selected by Architect and Resident Engineer from manufacturer's standards.

B. Base Accessories: Premolded end stops, internal corners and external corners of same material, size, and color as base.

2.06 ACCESSORIES

A. Adhesives:
1. Suitable for the underfloor substrate conditions involved as recommended by the Manufacturer of the flooring materials.
2. Adhesives shall be waterproof, stabilized type. Asphalt emulsions are not acceptable.
3. In accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

B. Crack and Joint Filler: Waterproof type as recommended by the Manufacturer.

C. Sealer:
1. Type recommended by Flooring Manufacturer.
2. In accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Inspect the sub-floor to receive resilient flooring in accordance with ASTM F710. Do not lay floor covering until sub-floors are in proper condition to receive same. Sub-floors shall be broom clean, free of foreign matter and thoroughly clean before installation.

C. Verify concrete floors are dry and bondable.

3.02 PREPARATION

A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Apply, trowel, and float filler to leave a smooth, flat, hard surface.

C. Prohibit traffic from area until filler is cured.

D. Vacuum clean substrate.

E. Apply primer to floor surfaces as recommended by Flooring Manufacturer.

3.03 INSTALLATION - TILE FLOORING

A. Install in accordance with Manufacturers' instructions and in accordance with "Recommended Work Procedures for Resilient Floor Coverings" of the Resilient Floor Covering Institute.

B. Mix tile from container to ensure shade variations are consistent.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Set flooring in place, press with heavy roller to attain full adhesion.

E. Lay tile flooring with joints parallel to building lines and with symmetrical tile patterns.

F. Install tile to pattern scheduled. Allow minimum 1/2 full size tile width at room or area perimeter.

G. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar.

H. Install edge strips at unprotected or exposed edges, and where flooring terminates.

I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

J. Install flooring under movable partitions without interrupting floor pattern.

K. Install edge strips where indicated. Fit joints tightly.

3.04 INSTALLATION - BASE

A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends use premolded units.

C. Install base on solid backing. Bond tight to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.05 CLEANING

A. After flooring has become well seated, minimum 72 hours, and just prior to opening it to traffic, thoroughly clean in accordance with Manufacturer's recommendations.
   1. Apply two coats of manufacturer's recommended wax to cleaned resilient flooring in accordance with manufacturer's published recommendations.

B. Remove dirt, debris and adhesive from floor covering and adjacent surfaces using Manufacturers recommended methods and leave installation in a clean, undamaged condition.

C. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

D. Construction Waste: In accordance with Section 01 74 19 .

3.07 PROTECTION

A. Minimize traffic until flooring has become well seated, at least 72 hours, at a maintained temperature of not less than 70 degrees F., and do not permit fixtures, equipment, trucks, or similar items on flooring.
   1. Provide temporary protection materials of underlayment board or other suitable protection sheets over flooring where it is necessary to move heavy or sharp loads across the floor within 72 hours after installation.
   2. Protect installed flooring by providing protective coverings or other protection as recommended by manufacturer until time of final completion of Project.

END OF SECTION

SECTION 09 77 33

FRP WALL PANELS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Manufacturer's Specifications and installation instructions for each material and accessory.

B. Submit Manufacturer's full range of color and pattern samples of wall panels and trim pieces for Architect's and Resident Engineer's selection. Submit two samples of selected products.

C. Submit cleaning and maintenance instructions in accordance with Section 01 77 00.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 DELIVERY, STORAGE AND HANDLING

A. Deliver materials clearly labeled to identify Manufacturer, brand name, quality or grade and fire hazard classification.

B. Store horizontally in original undamaged packages.

1.03 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Install materials when temperature and humidity conditions approximate conditions that will exist when building is occupied.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the specified Manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with Specification requirements.
1. Marlite www.marlite.com
2. Kemlite Company, Joliet, IL (800) 435-0080. www.kemlite.com
3. Or equal.

2.02 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. FRP Panels: Fiberglass reinforced plastic panels complying with the following:
1. Class: Class I (A) FR panels.
2. Thickness: 0.090.

3. Texture: Smooth.
4. Color: White.

C. Adhesive for panel installation:
1. Manufacturer's recommended type for use with selected materials, waterproof, mildew resistant nonstaining type.
2. In accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

D. Edge Sealant:
1. Type "E" clear mildew resistant silicone sealant as specified in Section 07 90 00, or mildew resistant sealant recommended by manufacturer for sealing panel edges and moldings.
2. In accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.

E. Moldings: Provide one of the following as selected by Architect and Resident Engineer.
1. Extruded anodized aluminum trim pieces, sizes as required to allow installation over combined thickness of panel and substrate. Use at internal and external corners.
2. One-piece vinyl of the following types, color to match FRP.
a. Panel Edges: "J" type Cap molding.
b. Panel to Panel: "H" type Division Bar molding.
c. Inside Corner: "J" type Inside Corner molding with radius edge.
d. Outside Corner: "J" type Outside Corner molding with extended leg.
e. Ceiling: "J" type Ceiling molding with radius edge, or use inside corner molding.

F. Fasteners: Manufacturer's standard nylon drive pins.

G. Miscellaneous Items: Furnish and install supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation whether or not specified or indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
1. Examine substrate and conditions under which the material is to be installed.
2. Verify that surfaces, when tested with moisture meter, have proper moisture content.
3. Verify that nails and screws are recessed, with joints and depressions taped, finish and sealed.
4. Remove contaminants from areas to be covered.
5. Do not proceed with Work until Work of other Trades which passes through wall covering has been completed and unsatisfactory conditions have been corrected.
6. Start of Work indicates acceptance of responsibility for performance and any required remedial Work.

3.02 INSTALLATION

A. Install panels in accordance with Manufacturer's printed instructions using full sheet mastic coverage method plus nylon fasteners.

B. Make joints with 1/8 inch space for expansion and use moldings designed for each condition for the Project.

C. Bevel back edges of panels with block plane to permit proper fit into moldings.

D. Place a continuous bead of sealant in the receiver channel of all moldings immediately prior to installation of FRP panels. Place continuous bead of sealant at all edges and tool to smooth, slightly concave shape.

E. If one end of panel must be mechanically fastened, do not fasten the other end.

F. Remove plumbing escutcheons, switchplates, wall plates, and surface-mounted fixtures, and cut wall paneling evenly to fit. Replace items after completion of Work.

G. Where applicable, install paneling before installation of plumbing, casings, bases, cabinets and other items to be applied over paneling.

3.03 CLEANING

A. Remove excess adhesive and smudges with soft cloth and mineral spirits.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 09 81 00

ACOUSTICAL INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Acoustical insulation above ceilings and within partitions as shown on Drawings and as specified.

1.02 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the specified Manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with Specification requirements.
1. Manville Building Products Group www.johnsmanville.com
2. Owens Corning Fiberglas www.owenscorning.com
3. U.S. Gypsum Company www.usg.com
4. Or equal.

2.02 MATERIALS

A. Sound Attenuation Blankets:
1. ASTM C665, Type 1 (unfaced), glass or mineral fiber batts, with a Fire Hazard Classification of less than 50 when tested in accordance with ASTM E-84.
2. Thickness: As indicated on Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install acoustical insulation batts in sound-rated stud partition walls where indicated on Drawings. Size batts for a friction fit and install in accordance with Manufacturer's recommendations.

B. Install acoustical insulation batts above lay-in ceilings, and other locations as shown on Drawings, in strict accordance with Manufacturer's printed instructions.

C. Butt ends of batts closely together and fill all voids.

3.02 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Painting as specified and as noted on Drawings. Surfaces requiring finishing and left unfinished by the requirements of other Sections shall be painted or finished as part of the Work of this Section.
1. Gypsum board shall be prime coated and receive 2 coats of paint.
2. Finished hardwood materials shall be stained, sealed and varnished.
3. Door frames, metal doors, and miscellaneous metals shall be painted unless provided with factory finish.
4. Exterior metal (building structure) which does not receive a factory finish shall be painted using High-Performance Finish Systems.

1.02 DEFINITIONS

A. Touch-Up: Painting of items missed by painter at no additional cost to Owner.

B. Re-Paint: Repairs to paint work for damages caused by other trades.

C. Block Resistance (Non-Blocking): The capability of a coating to resist sticking to itself when used on 2 surfaces that come in contact with each other (e.g. door and jamb, window sash and sill).

1.03 SUBMITTALS

A. Product Data: Submit schedule of manufacturers of products required for the Work, together with specifications recommended by each manufacturer.

B. Samples: Submit samples of each type of finish specified.
1. Architect will furnish Contractor a color schedule of colors selected either from manufacturer's stock colors or specially requested color mixes before Work is begun.
2. Submit two 8 inch x 10 inch samples of each color, including the correct sheen and texture, on heavy cardboard or masonry. Submit sealer and stain finishes on material of the same quality and species of wood on which that particular finish shall be used. Rejected samples shall be resubmitted until approved.
3. Samples shall be submitted at least 30 days prior to the start of painting work. Label and identify each sample as to location and application. Upon submittal of color samples, minor variations or changes in color selection may be requested by the Architect and new samples ordered, until final color approval.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.04 QUALITY ASSURANCE

A. Standards: Preparation, application and workmanship shall be in accordance with manufacturer's recommendations and applicable provisions of the following:
   1. Painting and Decorating Contractors of America (PDCA) "Painting Specification Manual" and "Standards".
      a. PDCA P1-09, "Touch-Up Painting and Damage Repair - Financial Responsibility and Definition of a Properly Painted Surface."
      b. PDCA P2-09, "Third Party Inspections: Qualifications, Responsibilities and Procedures."
      c. PDCA P3-09, "Designation of Paint Color."
      d. PDCA P4-09, "Responsibility for Inspection and Acceptance of Surfaces Prior to Painting and Decorating."
      e. PDCA P5-09, "Benchmark Sample Procedures for Paint and Other Decorative Coating Systems."
   2. Gypsum Association - GA210, "Gypsum Board for Walls and Ceilings."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Deliver materials to site in manufacturer's sealed containers, legends and labels, intact.

B. Storage:
   1. Adequately protect against damage while stored at site.
   2. In no case shall the amount or method of materials stored exceed the amount permitted or the manner allowed by local ordinances, state laws, or fire underwriter regulations.

1.06 PROJECT/SITE CONDITIONS

A. Physical Requirements for Proper Installation or Application: Do not apply exterior paint in damp or rainy weather or until after the surface has dried thoroughly from the effects of such weather.
   1. Do not apply varnish or paint when temperature is below 50 degrees F.. Avoid painting surfaces exposed to hot sunlight.
   2. During interior application, maintain minimum temperature of 65 degrees F. unless otherwise directed by Architect or manufacturer's printed instructions. Hold temperature as constant as possible.
   3. Provide adequate ventilation at all times so the humidity cannot rise above the dew point of the coldest surface to be painted.
   4. Moisture-containing surfaces, such as concrete, stucco and cement plaster shall have a moisture content of less than 8 percent as measured by moisture meter. Remove surface salt deposits prior to painting. Verify that pH is neutral, or within acceptable limits of Paint Manufacturer. Paint after thoroughly cured.

1.07 MAINTENANCE

A. Extra Materials: Upon completion of the Work, furnish Owner with one fresh gallon of each type and color of paint and finish used on this Project. Label containers with manufacturer's name, batch, color, shelf life, instructions, and cautions.

1.08 WARRANTY

A. Manufacturer's Standard Warranty: Furnish 2 year manufacturer's standard warranty covering materials and labor required to maintain paint finishes in good condition from date of Substantial Completion of the Work.
   1. Warranty shall cover repair or replacement of paint finishes (interior and exterior) that fail in materials or workmanship.
   2. Warranty shall cover all materials and installation from the substrate up including, but not limited to, removal of defective finishes, surface preparation, primers and finish coats in accordance with original specifications.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following manufacturers, except as otherwise approved by Architect, subject to compliance with specification requirements.
   1. Dunn-Edwards Corporation
   2. ICI Paints
   3. Kelly-Moore Paint Co.
   4. Sherwin Williams
   5. Or Equal.

2.02 MATERIALS

A. General
   1. LEED Certification:
      a. Contractor shall provide paint in compliance with USGBC LEED-NC 2009 Credit EQc4.2 which requires that paints and coatings used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) comply with the criteria listed on the Low Emitting Materials Form, Section 00 62 33:
      b. See Sections 01 81 13 and 01 60 00.
   2. Paints and coatings shall comply with CALGreen section 504.4.3.
   3. Colors: As selected by Archiect
      a. P-1 Paint – Color to match Benjamin Moore, Color: Collingwood OC-28 or equal.
      b. P-2 Paint – Color to match Benjamin Moore, Color: Carrot Stick 2016-30 or equal.
      c. P-3 Paint – Color to match Benjamin Moore, Color: Myan Gold 175 or equal.
      d. P-4 Paint – Color to match Dunn Edwards, Color: DE5522 Palm Frond or equal.

B. Provide materials in accordance with the Schedule of Paint Products at the end of this Section as applicable to project and as follows:
   1. Block resistant (non-blocking) materials shall be used for doors, door jambs, railings and other locations subject to handling, or where surfaces will come into contact with other painted surfaces or belongings.
   2. Shall not be formulated or manufactured with formaldehyde, halogenated solvents, aromatic hydrocarbons, mercury, or mercury compounds, or tinted with pigments of lead, cadmium, chromium VI, and their oxides
   3. Shall not be formulated or manufactured with formaldehyde, mercury, or mercury compounds, or tinted with pigments of lead, cadmium, chromium VI, and their oxides.

4. Materials used shall comply with applicable Federal and local air pollution regulations, lead content laws, and current VOC requirements. If products listed in Schedule of Paint Products located at the end of this Section are not in compliance with regulations, laws, or requirements, Contractor shall notify Architect and Resident Engineer and shall provide information regarding substitute products.

C. Basic painting materials such as linseed oil, shellac, turpentine, thinners, driers, and other similar products, shall be of highest quality, made by reputable, recognized manufacturers, and have identifying labels on containers. Paint materials shall be factory fresh.

D. Alternate materials submitted for approval shall have qualities and materials equal to the other listed manufacturer's scheduled products. Materials selected for coating systems for each type of surface shall be the products of a single manufacturer, unless otherwise specified or scheduled.

E. Standard Gloss Range: Provide paints in accordance with the following ranges in accordance with ASTM D523 and in accordance with Finish Legends on drawings:

Sheen	Geometry	Gloss Range
Flat	85 degree	Below 15 (see also Paint Finishes herein)
Eggshell	60 degree	5-20
Lo Luster	60 degree	15-25
Semi-Gloss	60 degree	25-50
Gloss	60 degree	Over 50

F. Paints shall be ready mixed except for field catalyzed coatings.

G. In addition to other requirements specified herein, provide the following when deemed appropriate:
1. Low-Biocide Paint: Interior use. Shall not contain formaldehyde. Shall not contain fungicides or bactericides that are classified as mercury acetates, phenol phenates, or phenol formaldehyde.
2. Natural Plant- and Mineral-Based Finishes: Contain extracts from plant sources and minimally processed earth minerals, such as chalk or iron oxides. Solvents include citrus oils and small amounts of low-odor petroleum solvents (de-aromatized isoparaffinics).
3. Milk-Based Paint: Contains lime, milk protein, clay, and earth pigments; interior use only; not suitable for damp conditions
4. Clay- and Mineral-Based Pigments:
   a. Native earths: Ochre, raw umber, raw sienna
   b. Calcined earths: Burnt umber, burnt sienna
   c. Iron oxides: Mars black, Mars yellow, Mars violet
5. Biocides: Provide paint with levels below 0.025%.

H. Transparent Finishes:
1. Urethane finishes: Water emulsion urethane
2. Penetrating oil-based, waterborne finishes: Shall not contain lead acetate or cobalt manganese (drying agents)
3. Stain: Vegetable oil-based, waterborne stain for exterior use with UV Protection
4. Acrylic: Waterborne, urethane; VOC less than 100grams/liter
5. Plant-based oil finish: Low odor, water reducible; interior use
6. Polymerized linseed oil: Interior use
7. Polymerized tung oil: Interior Use

I. Paint Strippers - Low-Emitting: Shall not contain methylene chloride. Avoid products containing methanol and trichloroethane.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report in writing with a copy to Architect and Resident Engineer, conditions detrimental to Work. Commencement of Work will be construed as acceptance of subsurfaces.

3.02 PROTECTION

A. Before painting, remove hardware, accessories, electrical plates, lighting fixtures and similar items and protect.
1. Provide “Wet-Paint” signs and other barricades and protections as required to protect adjacent surfaces and work of other trades, whether being painted or not.
2. Mask permanent labels.
3. Provide, distribute, and maintain a sufficient supply of clean drop cloths and other protective coverings.
4. Protect foliage and other exterior finished surfaces from contact with cleaning materials and thoroughly flush with water after contact.
5. On completion of each space, replace above items.

3.03 SURFACE PREPARATION

A. General:
1. Surfaces requiring painting or finishing shall be thoroughly dry and cured, free of dirt, dust, rust, stains, scale, mildew, wax, grease, oil, deteriorated substrates, bond-breakers, efflorescence and other foreign matter detrimental to the coating’s adhesion and performance. Repair voids, cracks, nicks and other surface defects with appropriate patching material. Finish flush with surrounding surfaces and match adjacent finish texture.
2. Spot prime marred or damaged shop coats on metal surfaces with appropriate metal primer.
3. Determine moisture content of plaster, stucco, cementitious materials, wood and other moisture-holding materials by use of a reliable electronic moisture meter.
4. Determine alkalinity of plaster, stucco and other cementitious materials by performing appropriate tests.
5. Do not paint surfaces where moisture content or alkalinity exceeds that which is allowed by paint manufacturer.

B. Wood:
1. Sandpaper to smooth and even surface and then dust off. After primer or stain coat has been applied, thoroughly fill nail holes and other surface imperfections with putty tinted with primer or stain to match wood color. Sand woodwork between coats to a smooth surface. Cover knots and sap streaks with a thin coat of shellac, or seal with a suitable stain blocking sealer.
2. Finish door and window edges after final fitting. Finish interior of cabinets in the same manner as the exterior unless otherwise specified. Seal interior of drawers unless otherwise specified.

3. Backpriming:
   a. Backprime exterior woodwork, which is to receive paint finish, with exterior primer paint.
   b. Backprime interior woodwork, which is to receive paint or enamel finish, with enamel undercoater paint.
   c. Backprime interior and exterior woodwork, which is to receive stain and/or varnish finish with VOC compliant varnish acceptable to the Architect and Resident Engineer.
   d. Back-prime wood trim before installation.
4. Where existing stained surfaces are indicated to be coated with a transparent stain, test apply stain to small area where directed by Architect and Resident Engineer and obtain Architect's and Resident Engineer's approval of color.

C. Steel and Iron:
1. Remove grease, oil, mill scale, rust and rust scale and touch-up chipped or abraded places on items that have been shop coated. Remove and reprime incompatible or damaged shop applied primers. Comply with the Steel Structures Painting Council's (SSPC) recommendations for cleaning of uncoated steel and iron surfaces.
2. When area will be exposed to view, sandpaper the entire primed area smooth, feather the edge of surrounding undamaged prime coat and spot prime in a manner to eliminate evidence of repair.
3. Where steel or iron at existing Work have a heavy coating of scale, remove by sand blasting, sanding, descaling, grinding or wire brushing, as necessary, to produce a satisfactory surface for painting.

D. Galvanized Metal and Aluminum:
1. Thoroughly clean by wiping surfaces with a non-hydrocarbon solvent that will not leave an oily residue. Apply surface conditioner or vinyl-wash pretreatment as required for proper adhesion if required by paint manufacturer. Prime galvanized metal with galvanized iron primer as recommended by paint manufacturer. A test sample of the complete painting system should be applied and checked for adhesion before final painting begins.
2. Clean visible portions of throats of galvanized steel ductwork with solvent; wipe dry with clean rags and paint flat black.

E. Concrete:
1. Existing exposed concrete structure shall be patched smooth to the satisfaction of the Architect and Resident Engineer prior to painting.
2. The method of surface preparation shall be at Contractor's discretion, provided the results are satisfactory to the Architect and Resident Engineer, and the method is in compliance with applicable codes and requirements.
3. Repair surfaces to be painted prior to application of prime and finish coat(s). Apply a tinted primer to the substrate to help identify surface imperfections. After the primer has thoroughly dried, patch, fill and repair surface imperfections to match and flush-out with adjacent finish texture and profile.
4. Before first paint coat is applied, spot prime nails and other exposed metal occurring in the surfaces with a rust inhibitive primer as recommended by paint manufacturer.

F. Plaster and Gypsum Board Surfaces:
1. Fill cracks, holes or imperfections with compatible patching material and smooth off to match adjoining surfaces. Before painting, surfaces shall be first tested for dryness with a moisture testing device.
2. Apply no paint or sealer on gypsum board or plaster when the moisture content exceeds 8 percent. Test sufficient areas in each space and as often as necessary to determine if the surface has the proper moisture content for painting. If the moisture content is between 8 percent and 12 percent, prime with alkali resistant primer.
3. If 8 percent or less, prime with specified primer. Remove the dry salt deposits from plaster surfaces by brushing with a stiff brush before painting.

3.04 WORKMANSHIP

A. Apply products to achieve paint manufacturer's printed specifications for dry mil thickness

B. Apply each coat of paint evenly and comply with manufacturer's drying time before applying subsequent coats.

C. Finished work shall be uniform, match approved color, texture and coverage, and free from runs, sags, clogging or excessive flooding. Make edges of paint adjoining other materials or colors sharp and clean, without overlapping. Where varnishes or enamel is used, lightly sand, dust and clean undercoats to obtain a smooth finish coat. Sand carefully between each coat of finish on smooth surfaces for good adhesion of subsequent coats.

D. Where clear finishes are required, ensure tinted fillers match wood. Work fillers well into the grain before set. Wipe excess from the surface.

E. Where specific mil thicknesses are required, check thickness by the following methods:
1. Over ferrous metal - Elecometer Film Gauge
2. Other surfaces - Tooke Dry Mil Inspection Gauge

3.05 APPLICATION

A. The number of coats scheduled is the minimum number of coats required. Additional coat(s) shall be applied, at no additional cost to the Owner, to completely hide base material, provide uniform color and to produce satisfactory finish results.

B. Apply coatings without thinning except as specifically required by label directions, or required by these specifications. In such cases, thinning shall be the minimum reduction permitted.

C. Priming will not be required on items delivered with prime or shop coats, unless otherwise specified. Review other specification sections in which primers are provided to ensure compatibility of the total system for various substrates. Touch up prime coats applied by others as required to ensure an even primed surface before applying finish coat.

D. Plumbing, Mechanical and Electrical:
   1. Exterior and interior exposed water, gas, waste piping, sprinkler piping, conduit, lighting and electrical panels, telephone terminal boxes, galvanized ducts and insulated ducts, shall be painted in areas other than mechanical rooms, unless otherwise scheduled.
   2. Paint exposed unfinished fixtures, metal ducts, switch boxes, control panels, devices, starters, junction boxes, vents, drains, and other similar items, as directed by Architect and Resident Engineer.

E. Spray paint prime coated (not pre-finished) grilles and registers with enamel or lacquer to match walls and ceilings. Paint materials shall not sag, run or bind movable parts of grilles, registers, louvers, baffles and other similar items.
   1. Throats of ducts shall be given one coat of flat black paint, wherever visibility of the interior of the duct is allowed through registers or other similar items. At fiber lined duct, use black latex paint.
   2. Examine the Mechanical and Electrical Drawings and Specifications to determine the amount of exposed work to be painted.

F. Paint exposed surfaces of every member; paint items inaccessible after installation before installation, if required to be painted. Edges, tops and bottoms of wood doors shall be sealed and finished with the same finish as the door faces, to meet door manufacturer's warranty requirements. Verify edge color with Architect and Resident Engineer as different colors may be selected for each face.

G. Paint items fitted with finish hardware after hardware has been temporarily removed.

H. Heating and other equipment on or adjacent to walls or surfaces scheduled for painting, shall be disconnected, using workmen skilled in appropriate trades and moved temporarily to permit painting of surface. Following completion of painting, replace and reconnect items.

I. Each succeeding pigmented coat shall be distinguishably lighter than the previous coat. Tint prime and undercoats to a color similar to finish coat. Each coat of material applied must be inspected and approved by the Architect and Resident Engineer before the application of the succeeding specified coat; otherwise no credit for the concealed coat will be given, and the Contractor shall assume the responsibility to recoat work in question. Contractor shall notify the Architect and Resident Engineer when each coat is completed.

J. Brush, wipe or roll stain in 2 coat application. Avoid lap marks by maintaining "wet-edge" continually being merged with existing liquid coverage and stop only at natural edges, turns and breaking places.

K. Do not paint over Underwriters' Laboratory labels, fusible links, exposed sprinkler heads and other similar items.

L. Paint piping, electrical or other equipment, conduit, vents and other similar items, on roof or other exterior locations as directed by Architect and Resident Engineer.

M. Finish closets and the interior of cabinets with same color as adjoining rooms, unless otherwise specified. Finish other surfaces same as nearest or adjoining surfaces, unless otherwise shown or scheduled.

N. Paint surface of walls which will be concealed by cabinets, chalkboards and other items attached to wall.

3.06 APPLICATION - PER PAINT MATERIAL TYPE

A. Water-Based Latex paint - Low-VOC: Comply with manufacturer's recommendations for application; may be applied by brush, roller, or sprayer.

B. Oil-Based Paint - Low-VOC: Comply with manufacturer's recommendations for application; sand lightly between coats and apply by brush or roller.

C. Recycled Latex Paint: Comply with manufacturer's recommendations for application; may be applied by brush, roller, or sprayer. Typically applied as primer, because colors not consistent.

D Low-Biocide Paint: Because of reduced shelf life, these products should be carefully evaluated for spoilage before applying. Comply with manufacturer's recommendations for application; may be applied by brush, roller, or sprayer.

E. Natural Plant- and Mineral-Based Finishes: These products do not necessarily perform or behave the same as conventional paints. They may require more coats or longer drying time. Comply with manufacturer's recommendations for application.

F. Milk-Based Paint (Casein): Available in powdered form. Add water and stir well. Transparency may be controlled by the amount of water added. In powder form it has an indefinite shelf life. May be applied by brush, roller, or sprayer. After mixing, do not keep beyond recommended shelf life (to avoid spoilage).

G. Urethanes - Water Emulsion: May be applied by brush, roller, or sprayer. Sand between coats; raises grain significantly.

H. Penetrating Oil Finishes: Apply three coats, one per day with a brush or cloth. Allow to set, wipe dry, and buff. Comply with manufacturer's recommendations for application. Do not apply when temperature is below 65°F.

I. Paint Strippers - Low-Emitting: Paint strippers that do not contain methylene chloride tend to be slower acting than conventional paint strippers and may take from one hour to overnight to work. Comply with manufacturer's recommendations for application. Use appropriate protection: impermeable gloves, respirators, goggles.

3.07 INDOOR AIR QUALITY

A. Applicators shall wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.

B. Maximize ventilation during application and drying.

C. Isolate area of application from rest of building.

D. Vacate space for as long as possible after application. Wait a minimum of 48 hours before occupying freshly painted rooms.

3.08 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Set aside extra paint for future color matches, or reuse by Owner, school theater sets, Habitat for Humanity, etc. Where local options exist for left-over paint recycling, collect all waste paint by type and provide for delivery to recycling or collection facility.

B. Close and seal tightly all partly used paint and finish containers and store protected in well-ventilated, fire-safe area at moderate temperature.

C. Place empty containers of solvent-based paints in areas designated for hazardous materials.

D. Do not dispose of paints or solvents by pouring on the ground. Place in designated containers for proper disposal.

E. Construction Waste: In accordance with Section 01 74 19.

3.09 ADJUSTING

A. At completion, do touch-up and re-paint work and leave finish surfaces in good condition.

3.10 CLEANING

A. During the course of the Work, remove misplaced paint and stain spots or spills. Leave Work in clean condition acceptable to Architect and Resident Engineer.

B. Remove oily rags and waste daily, taking precaution to prevent fire.

C. Water Pollution Control: In accordance with Greenbook/Whitebook requirements.

D. Storm Water Control: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

E. Environment Protection: In accordance with Greenbook/Whitebook requirements, Section 7-8.6.

3.11 SCHEDULES

A. Color Schedule:
1. Architect and Resident Engineer will provide a complete schedule of colors. Colors may be selected from various manufacturer's color palettes. Manufacturer supplying paint shall match these colors. Contractor shall prepare duplicate set of samples of treatments for major surfaces. If a specific surface or item receiving a paint finish does not have a specific color indicated or selected by the Architect and Resident Engineer, obtain clarification from the Architect and Resident Engineer. Do not assume the confirmation of the same color on the adjacent surfaces.
2. Final coat of paint shall be not be applied until colors have been approved by the Architect and Resident Engineer.

B. Schedule of Finishes: Refer to the "Finish Legend" on the Drawing for designated finishes of areas.

C. Finishing of the following listed items and materials will not be required and shall be protected:
1. Stainless Steel, brass, bronze, copper, monel, chromium, anodized aluminum; specially finished articles such as porcelain enamel, plastic coated fabrics, and baked enamel, unless otherwise indicated.
2. Finished products such as ceramic tile, glass, brick, resilient flooring and acoustical tiles, board and metal tees.
3. Pre-finished products such as wood folding partitions and doors, wood classroom and laboratory casework, bleachers and elevator cabs.

3.12 EXTERIOR PAINT FINISHES

A. Refer to Finish Schedule and Architectural Exterior Elevations.

3.13 INTERIOR PAINT FINISHES

A. Refer to Finish Schedule and Architectural Interior Elevations.

3.14 INTERIOR STAIN AND NATURAL-FINISH WOODWORK FINISHES

A. Refer to Finish Schedule and Architectural Interior Elevations.

END OF SECTION

SECTION 09 96 23

ANTI-GRAFFITI COATINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Anti-graffiti coating applied to exterior brick wall surfaces.

1.02 SYSTEM DESCRIPTION

A. Performance Requirements: The application shall leave the finished surfaces uniform in graffiti repellent and not alter the natural color and texture of the masonry units.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data sheets on all products to be used for the work. Submit description for protection of surrounding areas and non-masonry surfaces, surface preparation, application, and final cleaning.

B. Submit samples and manufacturer's instructions to the Architect and Resident Engineer for approval prior to delivering materials to the site or commencing the work in this Section.
1. Manufacturer shall procure and apply system to samples of the masonry units to be used in the structure which will be reviewed by the Architect and Resident Engineer for both aesthetics and effectiveness.
2. Manufacturers Instructions: Submit current method of installation stating the actual application rates required to meet the guarantee requirements.

C. Applicator Qualifications: Submit qualifications of applicator.
1. Certification stating applicator is experienced in the application of the specified products.
2. List of recently completed graffiti resistant coatings projects, including project name and location, names of Owner and Architect, and description of products used, substrates, applicable local environmental regulations, and application procedures.

D. Regulations: Submit applicable local environmental regulations.

E. Submit certification that graffiti resistant coatings furnished comply with regulations controlling use of volatile organic compounds (VOC).

1.04 QUALITY ASSURANCE

A. Applicator Qualifications:
1. Experienced in the application of the specified products.
2. Employs persons trained for the application of the specified products.

B. Pre-Application Meeting: Convene a pre-application meeting 7 days before the start of application of graffiti resistant coatings. Require attendance of parties directly affecting work of this section, including the Contractor, Architect and Resident Engineer, applicator, and manufacturer representative. Review environmental regulations, test panel procedures, protection of surrounding areas and non-masonry surfaces, surface preparation, application, field quality control, final cleaning, and coordination with other work.

C. Regulatory Requirements: Comply with applicable federal, state, and local environmental regulations.

D. Field Samples:
1. Before full-scale application, review manufacturer's product data sheets to determine the suitability of each product for the specific surfaces. Apply each graffiti resistant coating to test panels to determine number of applications, coverage rates, compatibility, effectiveness, surface preparation, application procedures, and desired results.
2. Apply graffiti resistant coatings to test panels in accordance with manufacturer's written instructions. Allow 48 hours or until test panels are thoroughly dry before evaluating final appearance and results. Do not begin full-scale application until test panels are inspected and approved by the Architect and Resident Engineer.
3. Test Panel Requirements:
   a. Size: Minimum 4 feet by 4 feet each, or as determined by the Architect and Resident Engineer.
   b. Locations: As determined by the Architect and Resident Engineer.
   c. Number: As required to completely test each graffiti resistant coating with each type of substrate to be protected.
4. Apply graffiti to test panel and remove graffiti from surfaces treated with coating in accordance with anti-graffiti coating manufacturer's recommended methods. If required, remove shadows/residues using compatible graffiti remover applied in accordance with manufacturer's written instructions.
5. If required by anti-graffiti coating manufacturer, reapply coating to restore graffiti protection.
6. Retain and protect test panels approved by the Architect and Resident Engineer in undisturbed condition during the work of this section, to be used as a standard for judging the graffiti resistant coating work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling: Store containers upright in a cool, dry, well ventilated place, out of the sun. Store away from all other chemicals and potential sources of contamination. Keep lights, fire, sparks, and heat away from containers. Do not drop containers or slide across sharp objects. Keep containers tightly closed when not in use. Store and handle materials in accordance with manufacturer's written instructions.

1.06 PROJECT CONDITIONS

A. Temperature Limitations:
1. Do not apply at surface and air temperatures below 40°F or above 90°F, unless otherwise indicated by manufacturer's written instructions.
2. Do not apply when surface and air temperatures are not expected to remain above 40°F for a minimum of 8 hours after application, unless otherwise indicated by manufacturer's written instructions.

B. Do not apply under windy conditions such that graffiti resistant coating may be blown to surfaces not intended to be treated.

C. Do not apply to frozen substrate. Allow adequate time for substrate to thaw, if freezing conditions exist before application.

D. Do not apply earlier than 24 hours after rain or if rain is predicted for a period of 8 hours after application, unless otherwise indicated by manufacturer's written instructions.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Anti-graffiti coating as manufactured by the following manufacturers are acceptable:
1. Rust-Oleum Corporation (OKON Graffiti Barrier Coat) www.okoninc.com
2. Diedrich Technologies, Inc. www.diedrichtechnologies.com
3. ProSoCo., Inc.. www.prosoco.com
4. Tamms Industries, Inc. www.tamms.com
5. Rainguard Products Company www.rainguard.com
6. Or equal.

2.02 GRAFFITI CONTROL COATINGS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.
3. Paints and coatings shall comply with CALGreen section 504.4.3.

B. Clear, one component silicone elastomer for protecting most masonry surfaces subject to repeated graffiti attacks.
1. Form: Liquid.
2. Color: Clear.
3. Active Substance: Silicone elastomer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PROTECTION

A. Protect surrounding areas, landscaping, building occupants, pedestrians, vehicles, and non-masonry surfaces not designated for protection during the work from contact with graffiti resistant coatings, masonry or concrete cleaners if used, residues, rinse water, fumes, wastes, and effluent in accordance with manufacturer's written instructions.

B. Apply graffiti resistant coatings before installation of windows.

C. Divert and protect pedestrian and auto traffic.

3.03 SURFACE PREPARATION

A. Clean dirt, dust, oil, grease, and other contaminants from surfaces that interfere with penetration or performance of graffiti resistant coatings. Use appropriate masonry or concrete cleaners approved by the graffiti resistant coating manufacturer where necessary. Rinse thoroughly using pressure water spray to remove cleaner residues. Allow surfaces to dry completely before application of graffiti resistant coatings.

B. Repair, patch, and fill cracks, voids, defects, and damaged areas in surface as approved by the Architect and Resident Engineer. Allow repair materials to cure completely before application of graffiti resistant coatings.

C. Apply specified sealants and caulking and allow to cure completely before application of graffiti resistant coatings.

D. Seal open joints.

E. Allow new masonry and concrete construction and repointed surfaces to cure completely before application of graffiti resistant coatings.

3.04 APPLICATION OF GRAFFITI CONTROL COATINGS

A. Apply graffiti resistant coatings to substrates in accordance with manufacturer's written instructions, environmental regulations, and application procedures determined from test panel results approved by the Architect and Resident Engineer.

B. Apply to clean, dry, cured, and properly prepared surfaces approved by the Architect and Resident Engineer.

C. Consult manufacturer's written instructions for information on application equipment to be used and precautions to be taken with the specified products.

D. Do not dilute or alter graffiti resistant coatings. Apply as packaged.

E. Do not apply to horizontal or below-grade surfaces.

F. Do not apply to asphalt or other non-masonry materials.

G. Do not apply to painted surfaces.

H. Do not apply to compensate for structural or material defects in substrates.

I. Avoid overspray, wind drift, and splash of graffiti resistant coatings.

3.05 FIELD QUALITY CONTROL

A. Examination: Examine the graffiti resistant coating work with the Contractor, Architect and Resident Engineer, applicator, and manufacturer's representative, and compare with test panel results approved by the Architect and Resident Engineer. Determine if the substrates are suitably protected by the graffiti resistant coatings.

B. Manufacturer's Field Services: Provide the services of a manufacturer's authorized field representative to verify specified products are used, and protection, surface preparation, and application of graffiti resistant coatings are in accordance with the manufacturer's written instructions and the test panel results approved by the Architect and Resident Engineer.

3.06 FINAL CLEANING

A. Clean site of unused graffiti resistant coatings, residues, rinse water, wastes, and effluent in accordance with environmental regulations.

B. Remove and dispose of materials used to protect surrounding areas and non-masonry surfaces, following completion of the work of this section.

C. Repair, restore, or replace to the satisfaction of the Architect and Resident Engineer, materials, landscaping, and non-masonry surfaces damaged by exposure to graffiti resistant coatings.

D. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 10 11 00

VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.01 SUBMITTALS

A. Shop Drawings: Submit brochures showing mounting techniques.

B. Samples: Submit color samples of visual display board surfaces.

C. Contract Closeout Submittals: Submit 2 copies of Manufacturer's printed maintenance instructions in accordance with Section 01 77 00.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.

B. Storage: Adequately protect against damage while stored at the site.

1.03 WARRANTY

A. Furnish Manufacturer's printed standard warranty.

PART 2 MATERIALS

2.01 MANUFACTURERS

A. Furnish products of one of the following Manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with Specification requirements.
1. Lemco Corporation
2. Tri-Adco Manufacturing Company
3. Claridge Products and Equipment Inc.
4. Best-Rite Chalkboard Company
5. Greensteel Inc.
6. Alliance Wall Corporation
7. Nelson-Adams Co. (Naco)
8. Or equal.

2.02 LIQUID MARKER BOARDS

A. Core: 3/8 inch particle board.

B. Backing: Aluminum foil.

C. Finish: 24 gage stretcher-level steel sheet manufactured in accordance with the performance specification for porcelain enamel steel chalkboards. Enamel finish shall be applied automatically to the steel, in a uniform thickness and fired under rigidly controlled temperatures to fuse the porcelain permanently to the steel. Finished surface shall be highly scratch and stain resistant, made for dry erase markers.

D. Aluminum Trim: Snap-on type.
1. Chalk trough: Claridge No. 271 or equal.
2. Map rail: Claridge No. 275 with No. 277 ground clip or equal, with 4 map clips per each 8'-0" section.
3. Side trim: Claridge No. 273 or equal.
4. Finish: Clear anodized.

2.03 FABRICATION

A. Factory assemble visual display board and ship to the job, ready to fasten to wall, pressure laminated to backing and framed on each side with extrusions as shown on review shop drawings and as specified.

B. Combination Units: Fabricate boards to be installed as combination units with vertical mullion type joint trim between adjacent boards for installation as one joined combination unit.

C. Aluminum extrusions: Cut to exact length and accurately. At corners, except at chalk trough, reinforcing angles shall be used.

D. Sizes: As indicated on Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work shall be construed as acceptance of subsurfaces.

B. Verify that substrate has been prepared for proper installation of resilient materials.

3.02 INSTALLATION

A. Visual Display Boards:
1. Install at locations shown on Drawings in accordance with Manufacturer's printed Specifications, except as otherwise detailed.
2. Install plumb, level and true to line, securely attached to grounds, blocking and supports.

3.03 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Exterior cast or fabricated metal building signage.
2. Interior identification signage.
3. Other signage as required.

1.02 SUBMITTALS

A. Product Data: Submit Manufacturer's brochures indicating materials and finishes.
B. Shop Drawings: Show sizes of members, method of construction, copy layout, and
B. Shop Drawings: Show sizes of members, method of construction, copy layout, and mounting details for proper mounting. Furnish template for mounting metal letters.

C. Samples: Furnish full size rubbing prior to casting plaque. Submit sample letter and anchoring device. Submit selection of aluminum plaque finishes for Architect's and Resident Engineer's approval.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:
1. ANSI A117.1, 1998 "Accessible and Usable Buildings and Facilities."
2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
3. ADA Accessibility Guidelines (ADAAG).

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage and Protection: Store items in dry, protected areas. Adequately protect against damage while stored at the site. Keep free of corrosion or other damage.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of Chalaine Signage (858) 566-8868 or equal with 2 years experience in manufacturing and installing signage, subject to compliance with Specification requirements:

2.02 MATERIALS

A. General: Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Materials shall be new stock, free from defects, imperfections strength, durability, and appearance. Provide materials as shown and detailed on drawings and as specified herein.

C. Metals - General:
1. For fabrication of exposed metal work, use only materials which are smooth and free of surface blemishes including pitting, roughness, seam marks, roller marks, and trade names.
2. Do not use materials which have stains and discolorations.
3. For exposed items of work which include plain flat surfaces in width of more than 50 times the metal thickness, provide sheet stock from mill which has been stretcher leveled to highest standard of flatness commercially available.

D. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM D 790, a minimum allowable continuous service temperature of 176 deg F (80 deg C), and of the following general types:
1. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, for background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended.
2. Transparent Sheet: Where sheet material is indicated as "clear," provide colorless sheet in matte finish, with light transmittance of 92 percent, when tested in accordance with the requirements of ASTM D 1003.
3. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer's standards.

E. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.

F. Vinyl Film: Opaque reflectorized vinyl film, 0.0035-inch minimum thickness, with pressure-sensitive adhesive backing, suitable for exterior as well as interior applications.

G. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

H. Tape: VHB (very high bond) double-stick foam tape as manufactured by 3M or equal.

I. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.03 SIGNAGE

A. Exterior signage and signage framing: Aluminum unless otherwise indicated on Architectural Building Elevation Drawings.

B. Interior Signage: All interior signage (wall and door) shall comply with applicable ADA requirements.
1. Base: Melamine plastic laminate, 1/8 inch thick, rated non-static, fire retardant and self extinguishing.
   a. Colors: As selected by Architect and Resident Engineer and in accordance with local and Federal requirements
   b. Mounting: Screw attach to wall or door or door frame as indicated by Construction Manager. Minimum 2 screws per sign. Height shall be 60 inches above finish floor to centerline of sign at wall mounted signs..
   c. Finish and contrast:
      (1) Matte finish.
      (2) Characters shall contrast with background by at least 20 percent.
2. Letters and Braille characters:
   a. Raised 1/32 inch upper case, sans serif or simple serif, and accompanied with Grade 2 Braille. Raised characters shall be at least 5/8 inch high, but not higher than 2 inches.
   b. Letters and numbers: Width-to-height ratio from 3:5 to 1:1, and stroke width-to-height ratio from 1:5 to 1:10.
   c. Text: Required quantity of each sign shall be as directed by Architect and Resident Engineer.

C. Provide the following signage and other signage as indicated on Drawings:
1. Wall sign: “EXIT” tactile wall sign (TWS) per CBC 1011.32 (see locations per drawings – near doors #100, #105B, 116B – total of three).
2. Wall sign: “STAIR UP” “STAIR DOWN” (see locations per drawings – reflected ceiling plan - total of 6).
3. Wall sign: “NOTICE: RECYCLED RAINWATER IS BEING UTILITZED IN TOILET FIXTURE” (filed verify exact sign location with Architect and Resident Engineer – typical of 8 locations).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Construction Manager. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.

B. At exterior locations, apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

C. Install plumb and level in accordance with Manufacturer's instructions.

D. Install engraved signs after surfaces are finished, in locations indicated.

E. Securely fasten wall mounted items to solid backing.

F. Clean and polish exposed surfaces.

G. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:

H. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.

I. Double-Stick Tape Mounting: Clean surfaces to be joined and apply double stick tape to back of wall mounted signage in continuous strips at approximate 2 inch center to center spacing between strips. Apply sign to wall surface taking care to properly align and plumb signage before removing release paper.

3.03 CLEANING

A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 10 14 53

TRAFFIC CONTROL SIGNS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Traffic Control Signage as shown on the Drawings and as specified.

B. Provide signage designating parking for any combination of low-emitting, fuel-efficient and carpool / van parking in accordance with CALGreen section 5.106.5.1

1.02 SUBMITTALS

A. Submit product data, shop drawings and samples in accordance with Section 01 33 00.

PART 2 PRODUCTS

2.01 MATERIALS

A. Metals: New stock, free from defects impairing strength, durability or appearance.

B. Plastics: New stock, free from defects and of the best quality available.

C. Paints: Type made for the surface material on which it is to be applied and recommended by the manufacturer of the paint. No paint that will fade, discolor or delaminate as a result of proximity to UV light sources or heat therefrom shall be used.

D. Signage Supports: Steel pipes with welded steel caps. Paint with acrylic polyurethane enamel.

2.02 FABRICATION

A. Fabricate in accordance with applicable local jurisdiction Standard Details and as indicated on Drawings.

B. Shop/Factory/Finishing:
1. Paint shall be thoroughly and evenly applied and shall be well worked into corners and joints and shall not have edge or joint buildups.
2. Paint shall be evenly applied and without pinholes, scratches, orange peeling, application marks, etc.
3. Workmanship in connection with finishes shall conform to the standard of the trade. Prime coats or other surface pre-treatments, where recommended by the manufacturer for paints, shall be included in the work.

PART 3 EXECUTION

3.01 ERECTION, INSTALLATION, APPLICATION

A. Install items square, plumb, true and accurately fitted. Leveling is to be done only by instruments.

B. Embed signage support pipes in concrete filled holes as detailed.

3.02 CLEANING

A. After installation, surfaces marred during erection, and exposed bolts, bolt heads, etc., shall be retouched with the same paint used previously.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 GENERAL

1.01 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the following:
1. ANSI A117.1, 1998 "Accessible and Usable Buildings and Facilities."
2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
3. ADA Accessibility Guidelines (ADAAG).

1.02 SUBMITTALS

A. Product Data: Submit Drawings and brochures of toilet accessory items showing sizes, construction and mounting techniques.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.

B. Storage: Adequately protect against damage while stored at site.

C. Handling: Comply with Manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. To establish function, capacity and quality, toilet accessories are based on products of Bobrick Washroom Equipment Co., Inc. Comparable toilet accessory products by one of the following Manufacturers may be provided, as approved by the Architect and Resident Engineer, subject to compliance with Specification requirements.
1. Bobrick Washroom Equipment Co., Inc. www.bobrick.com or equal.

2.02 MATERIALS

A. General: Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Stainless Steel: AISI, Type 302/304, with satin No. 4 finish. Unless specified or indicated, the use of other stainless steel alloys shall not be allowed.

C. Sheet Steel: Cold rolled, commercial quality, ASTM A1008. Surface preparation and metal pretreatment as required for applied finish.

D. Chromium Plating: Nickel and chromium electro-deposited on metal, ASTM B456, Type SC 2.

E. Galvanized Steel Mounting Devices: ASTM A123, hot-dip galvanized after fabrication.

F. Locks: Tumbler type, keyed alike unless specified otherwise.

G. Fasteners: Theft-proof screws. Use no adhesive mountings.

H. Backing Plates: 16 gage cold-rolled steel for mounting grab bars in stud partitions.

2.03 TOILET ACCESSORIES

A. See schedule on Architectural Drawings for fixture legend.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination with other Work: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Install items in accordance with Manufacturer's published instructions and approved installation drawings in locations as shown on Drawings, and in compliance with ANSI A117.1 as applicable.

B. Secure toilet room accessories to adjacent walls and partitions in accordance with the Manufacturer's instructions for each item and each type of substrate construction and as follows:
1. Attachment to Toilet Partitions: Secure at screw attachment point with sheet metal screws furnished by Manufacturer or by 3/16 inch diameter through-bolts.
2. Attachments of Recessed Accessories: Place shims between framing and cabinet at screw attachment points.
3. Attachment of Surface Mounted Accessories: At stud walls, provide concealed blocking or backing at screw points to allow attachments with No. 18 x 1-1/2 inch sheet metal screws. At solid walls, rawl plugs, expansion shields or toggle bolts shall be provided. Soap dispensers shall be mounted with 4 inch clearance from filler top to underside of any horizontal projection.

C. Grab Bars:
1. Framed wall construction: Install concealed anchor plates to studs. Attachment to studs must be sufficient to withstand a horizontal pull of 300 pounds. Accurately position and fasten before wall finish is applied. After wall surface is finished, secure concealed mounting plate to anchor plate using stainless steel machine screws furnished by the Manufacturer.
2. Toilet Compartments: Through-bolted connection to anchors.

D. Seal wall penetrations with sealant as specified in Section 07 92 00 to prevent moisture penetration through joints around fixtures.

3.03 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19 .

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Submit Manufacturer's data and installation instructions for each item, including dimensions and anchorage details.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 QUALITY ASSURANCE

A. Standards: Comply with ANSI/UL 92 and 711.

B. Regulatory Requirements: Conform to ANSI/NFPA 10 and the following:
1. ANSI A117.1, 1998 "Accessible and Usable Buildings and Facilities."
2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
3. ADA Accessibility Guidelines (ADAAG).

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following Manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with Specification requirements:
1. Amerex
2. Larsen's Manufacturing Co. www.larsensmfg.com
3. J.L. Industries www.jlindustries.com
4. General
5. Knox
6. Supra Products Co.
7. Or equal.

2.02 MATERIALS AND ACCESSORIES - GENERAL

A. Fire suppression equipment shall not contain CFC's, HCFC's or Halons and shall comply with LEED-NC 2009 EQc3 requirements.

2.03 EQUIPMENT

A. Multi-Purpose Dry Chemical Extinguisher:
1. Capacity and UL Rating: 6 lbs., 3A-40B:C.
2. Tank: DOT approved steel cylinder.
3. Metal valves and siphon tube.
4. Replaceable molded valve stem seal.
5. Pressure gauge.

B. Wall Bracket: Manufacturer's standard J-type for surface mounted fire extinguisher (SMFE).

C. Fire Extinguisher Cabinet for recessed fire extinguisher (RFE):
   1. Trim Style and Projection: Recessed, 5/16".
   2. Inside box dimensions: As required for extinguisher.
   3. Door:
      a. Vertical Duo with Clear Break Glass.
      b. Trim and Door (Steel): One piece, constructed of cold-rolled steel with a standard white baked acrylic enamel finish suitable for field applied finish as specified in Section 09900. Doors to be tubular, hollow-metal design.
   4. Recessed Box: Heavy gauge, white baked acrylic enamel box
   5. Cabinet Signage: Horizontal lettering "FIRE EXTINGUISHER" on door; color as selected by Architect and Resident Engineer.
   6. Cabinet Mounting Hardware: Appropriate to cabinet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Install items in accordance with Manufacturer's directions. Install cabinets plumb and level at heights shown on Drawings.

B. Comply with regulatory requirements and anchor securely.

C. Verify that extinguishers are charged and tagged.

D. Place extinguishers in cabinets and on wall brackets.

3.03 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 10 51 00

METAL LOCKERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Locker room lockers.

1.02 SUBMITTALS

A. Product data and installation instructions for locker units.

B. Shop Drawings that show locker locations and relation to adjacent surfaces. Show lockers in detail, method of installation, fillers, trim, base, and accessories. Include locker numbering sequence information.

C. Samples: Submit 2 samples or color chart for color selection(s).

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Uniformity: Provide lockers that are standard products of single manufacturer with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.

B. Regulatory Requirements:
1. ANSI A117.1, 1998 "Accessible and Usable Buildings and Facilities."
2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
3. ADA Accessibility Guidelines (ADAAG).

C. Designated ADA compliant units shall be affixed with “handicap accessible” label on door.

D. Shelf location and hook arrangements shall comply with ANSI standards and S.D.F.D. standards.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Do not deliver lockers until building is enclosed and ready for locker installation.

C. Storage and Protection: Adequately protect against damage during delivery, handling, storage, and installation.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following Manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with Specification requirements:
1. ASI Storage Solutions www.asilockers.com
2. Lyon Metal Products www.lyonmetal.com
3. Republic Storage Systems www.republicstorage.com
4. Or equal.

2.02 MATERIALS AND ACCESSORIES - GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

2.03 LOCKERS

A. Locker Room lockers: Heavy duty, non-rusting, 45% ventilated metal or other types of industrial material lockers (thermal plastic or others), 24 inches by 24 inches by 72 inches; 16 gauge stee, flat tops, bottoms and sides, 14 gauge steel doors with recessed handles with padlock attachment, and space for name tag. The lockers shall have a shelf at the top and three (3) each paired hooks, one on each side and one on the back.

B. Dorm Room lockers: Custom millwork in accordance with Section 06 40 00 – Architectural Woodwork and as per drawings. Lockers shall meet standard S.D.F.D personnel locker specifications. Provide a padlock eye set Master 60.

C. Trim: Furnish with 4 inch high Zee Base, and with fillers at front surfaces to close space between lockers and wall surfaces where required and end finishing panels.

D. Finish:
1. Provide manufacturer standard thermal-cured enamel or polyester powder coating.
2. Color: As selected by Architect and Resident Engineer.

3.01 EXAMINATION

A. Verification of Conditions:
1. Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.
2. Verify that prepared bases are in correct position and properly sized.

3.02 INSTALLATION

A. Assemble and install lockers in accordance with Manufacturer's recommendations and approved Shop Drawings.

B. Install plumb and square and fasten units together with bolts as standard with manufacturer.
1. Secure units to wall through back of units to solid blocking or studs or other solid structure with suitable anchors to resist 100 pounds pullout force.
2. Anchor units through locker floor to base.

C. Install end panels, corners, fillers and caps. Size trim units in field and scribe to adjacent surfaces.

D. Install number plates after installation to assure proper number sequence.

E. Verify doors and latches operate properly without binding.

F. Touch up minor blemishes as approved. Verify that doors and latches operate easily and properly.

3.03 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 10 75 00

FLAGPOLES

PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. Design Requirements: Comply with National Association of Architectural Metal Manufacturer's "Guide Specifications for the Design of Metal Flagpoles," Standard FP-1.

1.02 SUBMITTALS

A. Shop Drawings: Submit Drawings showing sizes, finishes, methods of installation and accessories.

B. Samples: Submit samples showing material and finish.

C. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.

B. Storage: Adequately protect against damage while stored at the site.

PART 2 PRODUCTS

2.01 FLAGPOLES

A. General: Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Pole: Custom, as detailed on Drawings.
1. Material: Aluminum, seamless cold drawn ASTM B241, 6063-T6 aluminum tubing with 0.188 inch wall thickness.
2. Height as indicated on Drawings.

C. Accessories: Equip pole with the following:
1. 14 gage aluminum ball, diameter sized to be compatible for height of pole.
2. Internal Halyard Fittings: Manufacturer's standard cable based internal halyard system with locking door and reinforced door frame assembly.
3. Truck Assembly: Revolving truck assembly.

D. Anodized Finish: Manufacturer's standard clear anodized finish, meeting AA M32-C22-A41.

E. Structural attachment to building: As detailed on Drawings. Provide metal fabrication materials in accordance with Section 05 50 00 and as shown on Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

3.02 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with Manufacturer's instructions.

B. Electrically ground flagpole installation.

3.04 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 11 31 00

RESIDENTIAL EQUIPMENT

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Submit Manufacturer's specifications and installation instructions.

B. Shop Drawings: Submit drawings showing space requirements, and piping and wiring rough-in locations for gas, water, power, and for ductwork.

C. Samples: Submit samples or brochures showing color selection.

D. Operating and Maintenance: Submit 2 copies of Manufacturer's instructions for operating and maintaining equipment.

E. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.02 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

1.03 WARRANTY

A. Furnish Manufacturer's standard 2 year warranty for each item of equipment.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT AND ACCESSORIES - GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

C. Refrigeration equipment shall not contain HCFC's or Halons.

D. Appliances shall comply with CALGreen section 5.210.1

2.02 EQUIPMENT

A. Dishwasher: Fire-Rescue Department will furnish dishwasher, Owner-Furnished, Contractor-Installed (OFCI).

B. Refrigerators: Fire-Rescue Department will furnish refrigerators, Owner-Furnished, Contractor-Installed (OFCI).

C. Gas Range and Oven: Fire-Rescue Department will furnish gas range and oven, Owner-Furnished, Contractor-Installed (OFCI).

D. Microwave Oven: Fire-Rescue Department will furnish microwave oven, Owner-Furnished, Contractor-Installed (OFCI).

E. Range Hood:
1. Stainless steel commercial grade sized to extend 6 inches beyond each stove edge (varies by stove model). A 60 inch range shall be provided and the hood shall be compatible with BTU output of the provided range.
2. Range hood shall include two (2) lights, a two-speed, roof-mounted exhaust fan with a ¾ HP motor capable of proper CFM, and removable washable stainless steel filter screens.
3. The hood shall conform to Health Code, I.B.C, I.M.C, and N.E.C. as adopted by the City and County of San Diego.

F. Refrigerators, stackable washer & dryer (gas) in clean room and side by side washer and dryer (gas) in locker room: Owner-Furnished, Contractorr-Installed (OFCI).

G. Exterior gas barbecue: Owner-Furnished, Contractor-Installed (OFCI).

H. Garbage Disposer: In-Sink-Erator, Evolution Essential® Model, 3/4 HP, 120 V, single phase, 8.1 amp, provide with cord kit option.

I. Colors: Provide manufacturer's standard colors. “Black” or “Stainless Steel” unless otherwise noted as selected by Architect and Resident Engineer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Install equipment at locations shown on Drawings in accordance with Manufacturer's instructions.

B. Contractor shall provide the following for residential equipment:
   1. Water supply for icemakers and electrical outlets and ventilation for four (4) 36" wide refrigerators.
   2. Gas supply and electrical outlets as required for 60 inch wide heavy duty gas range and oven. Clearance on each side of the range shall be a minimum of 6 inches and adjacent cabinets and rear wall shall be covered in stainless steel as specified in Section 05 70 00.
   3. Gas outlet and electrical outlet for barbeque.
   4. Electrical outlet in upper cabinet for microwave oven.

C. Connect equipment to power, water and ductwork rough-ins as applicable. Securely fasten built-in items where required.

3.03 FIELD QUALITY CONTROL

A. Tests: Test each item for proper operation. Check and adjust oven thermostats for correct temperature.

3.04 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19 .

END OF SECTION

SECTION 12 21 00

BLINDS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Horizontal Blinds as shown on the Drawings and as specified.

1.02 SUBMITTALS

A. Samples: Submit samples of blind materials, colors and patterns.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.

B. Storage and Protection: Adequately protect against damage while stored at the site.

C. Handling: Comply with Manufacturer's instructions.

1.04 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements; proper fit and attachment of parts is required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following Manufacturers, except as otherwise specified approved by the Architect and Resident Engineer, subject to compliance with Specification requirements:
1. Levolor Corporation www.levolor.com
2. Hunter Douglas Inc. www.hunterdouglas.com
3. Carey-McFall Corporation (Bali), Div. Springs Industries
4. Or equal.

2.02 MATERIALS AND ACCESSORIES - GENERAL

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

2.03 HORIZONTAL MINI-BLINDS

A. Levolor Riviera Contract, or equal.
1. Slats: 5000 Series magnesium aluminum alloy only, not to include reprocessed metals. Nominally 1.00 inches plus or minus .003 inch wide, and .0075 inch plus or minus .0003 inch thick (prior to coating); after coating, the thickness of the slats shall be nominally .0085 inch. Slats shall be unperforated.
2. Headrail: .025 inch thick Tomized steel, "U" shaped, 1 inch high x 1-9/16 inches wide. Enclose hardware in metal headrail.
3. Valance: Provide matching 1 inch slat valance with clips for attachment to headrail.
4. Tilter Mechanism: .042 inch thick Tomized steel housing with a self-lubricating nylon, automatically disengaging worm and gear mechanism to eliminate overdrive.
   a. Location: As selected by Architect and Resident Engineer.
5. Tilt Wands: Transparent with a hexagonal cross section 5/16 inch across flats.
6. Cord Lock: .042 inch thick Tomized steel and shall be crash proof.
7. Drum and Cradle: Provide for each ladder.
   a. Drums: .031 inch thick Tomized steel.
   b. Cradles: .042 inch thick Tomized steel.
8. Brackets: Minimum .048 inch thick Tomized steel with a rivet-hinged safety locking front cover to permit removal of headrail without lateral movement.
9. Ladders (slat supports): Distance between slats shall not exceed 14.2 slats per vertical foot.
10. Bottom rail: .025 inch thick Tomized steel.
11. Color: As selected by Architect and Resident Engineer from manufacturer's full range of available colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination with other Work: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Install window blinds in strict accordance with Manufacturer's instructions. Install straight and plumb, securely fastened, and with horizontal lines level and true with window framing.

B. Evidence of drilling, cutting and fitting to room finish shall be concealed in the finish work. Provide uniform clearance at edges not to exceed 3/16 inch. Adjust hardware for smooth operation.

C. Install blinds between vertical window mullions with discontinuous head channel and slats, allowing independent blind operation for separate glazing units.

3.03 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 12 48 23

ENTRANCE FOOT GRIDS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Entrance foot grids at entryways.

1.02 SUBMITTALS

A. Shop Drawings: Submit drawings which include dimensions, details, anchorage finishes and accessories.

B. Product Data: Submit manufacturer's specifications and color chart.

C. Samples:
1. Submit manufacturer's sample (12-inch x 12-inch) showing required texture and color.
2. Submit 12 inch length of frame member.

D. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection: Upon delivery to the job, store mats in a dry, ventilated space, and protect from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. As manufactured by Construction Specialties, Inc. (760) 734-4000 or equal.

2.02 MATERIALS

A. Frames: Extruded aluminum alloy (per manufacturer). Areas of frame to come in contact with cementitious material shall be coated with zinc chromate paint or manufacturer's standard protective coating.

B. Foot Grid (recessed into concrete): C/S Model #635A-B-LB or equal, serrated extruded 6105-T5 alloy aluminum. Color to be black. Provide custom size as shown no drawings and as directed by Architect and Resident Engineer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine the areas and conditions under which the work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install floor mats at locations indicated in strict accordance with manufacturer's printed instructions and approved shop drawings.
   1. Align work plumb, level, and flush with adjacent surfaces.
   2. Install in direction as indicated on Drawings.

3.03 CLEANING

A. Upon completion of this portion of the work, promptly clean exposed portions and remove traces of dirt, grease and foreign materials.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 12 93 13

EXTERIOR BICYCLE RACKS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Bicycle racks as shown on Drawings and as specified herein.

B. LEED Certification: Contractor to provide suitable means for securing bicycles with convenient changing/shower facilities as indicated on Drawings and as specified herein and in Division 22, for 5% of all building users as required by the U.S. Green Building Council (USGBC) LEED (Leadership in Energy & Environmental Design) Version 3 Sustainable Sites - Credit 4.2 - Alternative Transportation as specified in Section 01 81 13 – Sustainable Design Requirements.

C. Comply with CALGreen section 5.106.4.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions.

1.03 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with manufacturer's instructions.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Bicycle Racks: The Bike Rib, Series 1.5, inground mount, as manufactured by Function First, Inc., Tucson, AZ (888) 245-3741 www.bikerack.com or equal. Number of bikes/loops as indicated on Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurface to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this work.

3.02 INSTALLATION

A. Install bicycle racks in accordance with manufacturer's directions.

B. Install plumb and securely anchored; coordinate with concrete footing if required.

3.03 CLEANING

A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition in accordance with Section 01 50 00.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 14 21 00

ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gearless electric traction elevators.

1.02 REFERENCES

A. Industry and government standards referenced include the following:
1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
2. ADAAG – Accessibility Guidelines for Buildings and Facilities
3. ANSI/NFPA 70, National Electrical Code
4. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

1.03 PERFORMANCE REQUIREMENTS

A. Car Performance
1. Car Speed ± 5% of contract speed under any loading condition or direction of travel.
2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.

B. System Performance – Passenger Elevators:
1. Vertical Vibration (maximum): 15-17 mg
2. Horizontal Vibration (maximum): 10-12 mg
3. Jerk Rate (maximum): 3.3-5.25 ft/sec^3
4. Acceleration (maximum) 1.6 to 2.6 ft/sec^2
5. In Car Noise: ≤ 55 dB(A)
6. Leveling Accuracy: ±0.3 mm
7. Starts per hour (maximum): 240

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product literature for each proposed system.
1. Cab design, dimension and layout
2. Layout, finishes, and accessories and available options.
3. System capacity and performance.
4. Controls, signals and operating system.
5. Color selection charts for cab and entrances.

B. Shop Drawings:
1. Clearances and travel of car,
2. Clear inside hoistway and pit dimensions.
3. Location and layout of equipment and Signals
4. Car, guide rails, buffers and other components in hoistway.
5. Maximum rail bracket spacing.
6. Maximum loads imposed on building structure.
7. Hoist beam requirements
8. Location and sizes of access doors
9. Location and details of hoistway door and frames
10. Electrical characteristics and connection requirements

C. Wiring diagram detailing wiring for power, signal and control systems differentiating clearly between manufacturer-installed wiring and field-installed wiring. Indicate maximum and average power demands.

D. Samples: Submit two (2) samples of interior finish materials.

E. Quality Control Submittals:
1. Test Reports:
2. Certificates:

F. Closeout Submittals:
1. Manufacturer's operation and maintenance manuals.
2. Inspection Certificates and Permits.
3. Manufacturer's Standard Warranty
4. Parts List and Wiring Diagrams.

1.05 QUALITY ASSURANCE

A. Manufacturer: Shall have substantial experience in the fabrication, installation and service of elevators. Manufacturer shall be ISO 9001 certified, and have a documented quality assurance program.

B. Installer: The manufacturer shall install Elevator, or a manufacturer approved installer with substantial experience in the installation and service of traction elevators.

C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests. In addition, obtain State of California permits and inspections for the construction and operation of the elevator.

D. Prior to beginning work of this Section, attend a pre-installation meeting. Owner, Design Professional, and contractors with adjacent or related work shall attend.

1.06 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of elevator material throughout construction.

B. Store elevator materials in protected environment in accordance with manufacturer recommendations.

1.07 WARRANTY

A. Provide manufacturer's standard project warranty, signed by Sub-Contractor, Installer, and Manufacturer, agreeing to replace, repair, or restore defective materials and workmanship of elevator work during warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contract under the Contract Documents.
1. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty period is 24 months starting on date of Substantial Completion.

1.08 MAINTENANCE SERVICE

A. Maintain a regular service facility in the area in which the system is located and furnish regular maintenance service on the system for a period of 12 months. Work shall include regular examinations by trained employees and necessary adjustments, greasing, oiling and parts to keep equipment in operation, except parts made necessary by misuse, accidents or negligence by parties other than Contractor. The Work shall be performed only by elevator installer and not sublet, transferred or assigned to another party.

B. Perform maintenance with trained employees during regular working hours of the Trade under direct supervision of the elevator installer.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Furnish products of the following Manufacturers subject to compliance with Specification requirements.
1. KONE Inc., Moline, IL (800) 956-KONE www.kone.com
2. Otis Elevator Co. (Gen 2 Product)
3. Schindler Elevator Corporation (400A Product)
4. Or equal.

B. Specifications are based on EcoSpace™ traction elevators by KONE, Inc. or equal.

2.02 MATERIALS

A. Steel
1. Sheet Steel for Exposed Work: Stretcher-leveled, cold-rolled, commercial-quality carbon steel, complying with ASTM A366, matte finish.
2. Sheet Steel for Unexposed Work: Hot-rolled, commercial-quality carbon steel, pickled and oiled, complying with ASTM A569.
3. Structural Steel Shapes and Plates: ASTM A36 and AISI 1018.

B. Stainless Steel: Type 300 Series complying with ASTM A167, with standard tempers and hardness required for fabrication, strength and durability.
1. Supply with mechanical finish on fabricated work in the location shown or specified with texture and reflectivity required (Federal and NAAMM nomenclature). Protect with adhesive plastic film or paper covering.
2. All finishes specified as “satin” to be manufacturer’s standard directional polish that complies with commercial No. 4 requirements.
3. Material may vary per specification.

C. Aluminum: Extrusions per ASTM B221; sheet and plate per ASTM B209.

D. Plastic Laminate: ASTM E84 Class B and NEMA LD3, 0-1/20” (1.3 mm) up to 0-1/16” (1.6 mm) nominal thickness. Exposed surfaces to have color selected by Architect and Resident Engineer from manufacturer’s standard selection.

E. Fire-Retardant Treated Particleboard Panels: Minimum 0-1/2” (13 mm) thick backup for plastic laminate veneered panels, provided with suitable anti-warp backing; to meet ASTM E84 Class “A” rating with flame-spread rating of 25 or less.

F. Paint:

1. Concealed Steel and Iron: Clean metal of oil, grease, scale and other foreign matter and paint one shop coat of manufacturer's standard rust-resistant primer. Galvanized metal need not be painted.
2. Exposed Steel: Clean exposed metal of oil, grease, scale and other foreign matter. Eliminate any dents, scratches, or other defects that would affect the final finish. For material delivered with primer coat only, apply enamel primer. For material delivered with a finish coat, apply two coats enamel.

2.03 EQUIPMENT: ELEVATOR CONTROL COMPONENTS

A. Controller: Provide microcomputer based control system to perform all of the functions. The system shall also perform car and group operational control.
1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
3. Provide a serial card rack and main CPU board containing a non-erasable EPROM and operating system firmware.
4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.

B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.

C. Controller Location: Refer to Drawings.

2.04 EQUIPMENT: HOISTWAY COMPONENTS

A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.

B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.

C. Buffers, Car and Counterweight: Polyurethane buffer.

D. Hoistway Operating Devices:
1. Emergency stop switch in the pit
2. Terminal stopping switches.
3. Emergency stop switch on the machine

E. Positioning System: System consisting of magnets and proximity switches.

F. Guide Rails and Attachments: Steel rails with brackets and fasteners. Side counterweight arrangements to have a dual-purposed bracket that combines one car rail with one counterweight rail on the machine side. Additional bracket supports the other counterweight rail on the machine side and a separate bracket supports the other car rail opposite the machine.

G. Ropes: Provide five hoist ropes 10-mm diameter fabricated from steel wire wound about a steel core.

H. Governor Rope: Provide 3/8-inch diameter steel cable governor rope minimum eight strands wound about a sisal core center.

I. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.

J. Hoistway Entrances
1. Frames: 16-gauge sheet steel, bolted construction.
2. Sills: Extruded aluminum.
3. Doors: Hollow metal construction with vertical internal channel reinforcements.
4. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.
5. Entrance Finish: #4 brushed stainless steel, unless otherwise indicated on Interior Drawings.
6. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plates shall be flush mounted. Plate finish to match #4 brushed stainless steel.

2.05 EQUIPMENT: CAR COMPONENTS

A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.

B. Platform: Platform shall be all steel construction.

C. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.

D. Load weighing device shall be strain gauge type mounted to dead-end hitch attached atop the hoistway guide-rail.

E. Steel Cab:
1. Panels: Non-removable vertical panels, plastic laminate selected from standard manufacturer's catalog of choices
2. Car Front Finish: Brushed stainless steel.
3. Car Door Finish: Brushed stainless steel – single slide.
4. Ceiling: Suspended ceiling #LF-88 stainless steel finish with rated LED light fixtured
5. Handrail: Round Tubular Metal of 1-1/2 inch outside diameter. Material to be brushed stainless steel. Rails to be located on sides and rear of car enclosure. Provide flat end-caps of same finish and material as the handrail.
6. Flooring: Match adjacent flooring on ground floor (Porcelain Tile)
7. Threshold: Aluminum\
8. Side Wall (166A): 4813-60 Nickel EV Laminate.
9. Rear Wall (166A): 4813-60 Nickel EV Laminate.
10. Car Fan: Yes.
11. Protection Pads: Yes, by elevator manufacturer.

F. Emergency Car Signals:
1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.

2. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

G. Ventilation: No fan.

2.06 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation.
1. Provide integral car operating panel. Panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have amber illumination (halo) and shall be 1/4 inch projecting targets. All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be amber DOT-matrix. All texts, when illuminated, shall be amber. The car operating panel shall have a brushed stainless steel finish.
2. Additional features of car operating panel shall include:
a. Car Position Indicator within operating panel (amber).
b. Elevator Data Plate marked with elevator capacity and car number on car top.
c. Illuminated alarm button with raised markings.
d. In car stop switch key.
e. Firefighter's hat
f. Firefighter's Phase II Key-switch
g. Call Cancel Button
h. Firefighter's Phase II emergency in-car operating instructions.
i. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.

B. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Hall fixtures shall have a brushed stainless steel finish.
1. Hall fixtures shall feature round, mechanical, buttons in applied mount face frame. Hall fixtures shall correspond to options available from that landing. Buttons shall be 1/4 inch projecting in vertically mounted fixture. Hall lanterns and hall indicators shall be illuminated by means of amber illumination.

C. Hall Lanterns and Chime: A directional amber colored lantern visible from the corridor shall be provided at each hall entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound. The chime will sound once for up and twice for down.

D. Combination Hall Position Indicator and Hall Lantern located at Lobby Level landing.

2.07 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation
1. Passenger Elevators: Using a microprocessor-based controller, the operation shall be automatic by means of the car and hall buttons. Car can be made to park at the pre-selected main landing. .

B. Standard Operating Features to include:
1. Full Collective Operation
2. Fan and Light Control.
3. Load Weighing Bypass.
4. Ascending Car Uncontrolled Movement Protection
5. Firefighters' Service Phase I and Phase II.
6. Top of Car Inspection Station.
7. (Duplex Collective Operation Groups) Zoned Car Parking.
8. (Duplex Collective Operation Groups) Relative System Response Dispatching

C. Additional Operating Features to include:
1. Independent Service.
2. Intercom Provisions.
3. Automatic Standby Power Operation with Manual Override.

D. Elevator Control System for Inspections and Emergency
1. Provide devices within controller to run the elevator in inspection operation.
2. Provide devices on car top to run the elevator in inspection operation
3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.
5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.

2.08 EQUIPMENT: DOOR OPERATOR AND CONTROL

A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.

B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.

C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.

D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.

E. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.

B. Do not proceed with work until unsatisfactory conditions are corrected

3.02 PREPARATION

A. Coordinate installation of anchors, bearing plates, brackets and other related accessories

3.03 INSTALLATION

A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.

B. Properly locate guide rails and related supports at locations in accordance with manufacturer's recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.

C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.

D. Lubricate operating system components in accordance with manufacturer recommendations.

E. Perform final adjustments, and necessary service prior to substantial completion

3.04 TESTING AND INSPECTIONS

A. Perform recommended and required testing in accordance with authority having jurisdiction.

B. Obtain required permits and provide originals to Owner's Representative.

3.05 DEMONSTRATION

A. Prior to substantial completion, instruct Owner's Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures

3.06 SCHEDULE

A. Passenger Elevator Equipment: KONE EcoSpace™ gearless traction elevator or equal.

B. Equipment Control: Microprocessor KCM831 control system or equal.

C. Quantity & Elevator Numbers: One.

D. Number of Stops: 3

E. Openings: Front – offset opening.

F. Rise: 1st floor to 3rd floor - refer to Drawings.

G. Rated Capacity: 2,500 lb

H. Rated Speed: 150 fpm

I. Clear Inside Dimensions (W x D): 6'-8" x 4'-3"

J. Car Height: 8'-0"

K. Clear height under suspended ceiling: 7'-3".

L. Entrance Width: 3'-6"

M. Entrance Height: 7'-0".

N. Main Power Supply: 480 Volts ± 5%, three-phase.

O. Operation: Simplex.

P. Machine Location: Mounted on car guide rail.

Q. Control Space Location: Remote Closet at Upper Level.

R. Elevator Equipment shall conform to the seismic requirements of the 2009 IBC.

S. Maintenance Service Period: 12 months.

END OF SECTION

SECTION 21 01 50

FIRE PROTECTION (SPRINKLER SYSTEM) COORDINATION

PART 1 GENERAL

1.01 QUALITY ASSURANCE

A. The fire sprinkler system designer/subcontractor shall ensure that all exposed piping, valves, connections, drains and apparatus of any kind shall be fully reviewed and coordinated with the Architect and Resident Engineer. Exposed sprinkler heads shall typically be placed in the center of the ceiling tile or pattern. The shop drawings shall explicitly cloud all exposed conditions and shall be reviewed, authorized and initialed by the Architect and Resident Engineer prior to installation. The purpose of this review is to insure that all components of this system are placed in as discrete and as minimally impacting a location as possible. Failure by the fire sprinkler system designer/subcontractor to point out and secure Architect and Resident Engineer review and written approval of all exposed conditions shall result in relocation of any exposed items as directed by the Architect and Resident Engineer at no additional cost to the owner. The Contractor shall also provide the owner with one safety device head capping device for each different type of sprinkler head utilized in the project.

B. Contractor shall ensure that hangers, supports, pipes, braces to be hung true and vertical (neat and clean) where exposed to view in conditioned spaces and other customer zones as directed by Architect and Resident Engineer.

1.02 SUBMITTALS

A. See additional Fire notes on the drawings and required design drawings for Fire Protection system (Sprinkler) from selected subcontractor for fire dept. review and approval prior to installation.

1.03 PROJECT/SIDE CONDITIONS

A. Contractor shall field verify existing ceiling heights in strategic rooms where ceiling is going to be raised and/or replaced. Contractor shall include modification of of heads and small supply lines to these heads as part of their bid. Note: major lateral lines are to remain unless otherwise noted in drawings.

END OF SECTION

SECTION 22 00 00

PLUMBING

PART 1 - GENERAL

2.1 SUMMARY

A. The work under this section includes the furnishing of all labor, material and equipment and performing all operations in connection with plumbing work, as indicated on the drawings, specified herein, or reasonably implied to complete the work. This includes but is not necessarily limited to:

1. Sanitary sewer and vent system
2. Rainwater drain system
3. Condensate drain system
4. Domestic water system
5. Fuel gas system
6. Compressed air system

B. The word "piping" in this section includes pipe, fittings, nipples, valves, and any accessory pertinent to mains and connections throughout the system.

2.2 RELATED DOCUMENTS

A. The applicable requirements from the following sections shall form a part of this section.

Section 23 03 00 Basic Mechanical Requirements

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials, fixtures, and equipment shall be new and of the type and grade specified. All materials used for the same general use shall be of the same type, grade and manufacturer.

B. Unless otherwise specified, all exposed ÃP@ traps shall be adjustable, 17 gauge, chrome plated brass.

C. Unless otherwise specified, all exposed angle stops, nipples, and escutcheons shall be chrome plated brass.

D. Accessible plumbing fixtures shall comply with all of the requirements of CBC section 1115B.

E. Heights and location of all fixtures shall be in accordance with CBC table 1115B-1.

F. Fixture controls shall comply with CBC section 1118B.

2.2 FIXTURES

A. Protection: Cover and protect all fixtures until completion.

B. Exposed Metal: Unless otherwise specified, all exposed metal at fixtures shall be polished chrome plated.

C. Suppliers: Unless otherwise specified, individual fixtures shall all be from the same manufacturer, not intermixed.

D. Water Closet, WC-1

1. Water Closet shall be 15", floor mounted, white vitreous china, siphon jet, with elongated bowl, 1.6 gallon flush valve, and 1-1/2" top spud. Water closet shall be American Standard Madera 2234.015, or equal.

2. Flush Valve shall be chrome plated, 1.6 gallon flush, with connection for 1-1/2" top spud, bumper on angle stop, and vacuum breaker. Flush valve shall be Sloan Royal 111, Zurn Z-6000XL-WS1, or equal.

3. Seat shall be white, solid plastic, elongated, contoured, with open front, and integrally molded bumpers. Seat shall be Olsonite 95, or equal.

E. Water Closet, ADA, WC-2

1. Water closet shall meet the American Disabilities Act Guidelines and California C.C.R. Title 24. Water closet shall be 17", floor mounted, white vitreous china, siphon jet, with elongated bowl, 1.6 gallon flush, and close-coupled tank with trip lever on the wide side of the stall. Water closet shall be American Standard "Cadet" 2216.143, or equal.

2. Seat shall be white, solid plastic, elongated, contoured, with open front, and integrally molded bumpers. Seat shall be Olsonite 95, or equal.

F. Lavatory, ADA, L-1

1. Lavatory shall meet the American Disabilities Act Guidelines and California C.C.R. Title 24. Lavatory shall be wall mounted, white vitreous china, 18 x 20 inch, with back splash, 4 inch centerset, and designed for concealed arm carrier. Lavatory shall be American Standard "Lucerne" 0355.012, or equal.

2. Faucet shall meet the American Disabilities Act Guidelines and California C.C.R. Title 24. Faucet shall be polished chrome plated brass, 4 inch centerset, slow closing, metering, vandal proof, with 0.5 gpm rose spray outlet, blade handle, and grid strainer drain assembly. Faucet shall be Symmons "Scot" S-60-G-H, or equal.

3. Carrier shall be floor mounted with concealed arms. Carrier shall be J.R.Smith, Zurn, or equal.

G. Lavatory, L-2

1. Lavatory shall be counter mounted, self-rimming, white vitreous china, 17 x 20 inch oval, with faucet ledge and 4 inch centerset. Lavatory shall be American Standard "Aqualyn" 0476.028, or equal.

2. Faucet shall be polished chrome plated brass, 4 inch centerset, single water connection, slow closing, metering, vandal proof, with rose spray outlet, and grid strainer assembly. Faucet shall be Chicago Faucets 857-669, or equal.

H. Lavatory, ADA, L-3

1. Lavatory shall meet the American Disabilities Act Guidelines and California C.C.R. Title 24. Lavatory shall be wall mounted, white vitreous china, 18 x 20 inch, with back splash, 4 inch centerset, and designed for concealed arm carrier. Lavatory shall be American Standard "Lucerne" 0355.012, or equal.

2. Faucet shall meet the American Disabilities Act Guidelines and California C.C.R. Title 24. Faucet shall be polished chrome plated brass, 4 inch centerset, slow closing, metering, vandal proof, with 0.5 gpm rose spray outlet, blade handle, and grid strainer drain assembly. Faucet shall be Symmons "Scot" S-60-G-H, or equal.

3. Carrier shall be floor mounted with concealed arms. Carrier shall be J.R.Smith, Zurn, or equal.

I. Shower Unit, SH-1

1. Shower Valve and head shall be polished chrome plated brass. Valve shall be pressure balancing, mixing, with a single lever. Shower head shall restrict flow to 2.5 GPM. Shower valve and head shall be Moen Posi-Temp T2444m or equal.

J. Sink , S-1

1. Sink shall be 18 gauge, stainless steel, fully undercoated, self rimming, 21 x 24 inch, with 5 inch deep single bowl, 4.5 inch rear faucet ledge with 3 faucet holes on 4 inch centers, and a flat grid strainer. Sink shall be Kindred Commercial ALBS6105P, or equal.

K. Sink, S-2

1. Sink shall be 18 gauge stainless steel, number 4 finish, fully undercoated, self-rimming, 19 x 32 inch, with two 10 inch deep bowls, 4.5 inch rear faucet ledge with 3 faucet holes on 4 inch centers, two holes for spray accessory and filtered water spigot, a garbage disposer, spray and hose and a removable stainless steel strainer basket with rubber seat stopper. Sink shall be Kindred Commercial D6410PCB-1-1, or equal.

2. Faucet shall be center holde only, brass, lead free body, washer-less ceramic drip-free disc vlave cartridge, 15” high swivel spout with 6-1/2” clearance. 2.2 gpm max. flow spray, swivel spray with adjustable spray pattern automatically extends when water is turned on and auto retracts when water is turned off. Single control metal lever handle,

3. Garbage disposer shall have stainless steel grinding elements, anti-splash baffle, overload protection, 3/4 horsepower motor, plug-in connection, dishwasher drain connection and manual switch. Disposer shall be In-Sink Erator model SS-75, or equal.

L. Sink , S-3

1. Sink shall be 14 gauge, grade 18-10 Type 304 stainless steel, 19”x20” inch, with 13 inch deep single bowl, and vandal resistant open grid strainer.. Sink shall be Just J-127 or equal.

2. Faucet shall be chrome plated brass, wall mounted with brass spout & pail hook, vacuum breaker. Faucet shall be Just JVB1200, or equal.

3. Carrier shall be floor mounted with concealed arms. Carrier shall be J.R.Smith, Zurn, or equal.

M. Mop Sink, MS-1

1. Mop sink shall be enameled cast iron, 28 x 28 x 13 inch, corner model, with 3 inch strainer outlet and vinyl rim guard. Mop sink shall be Fiat TSBC-1610, or equal.

2. Faucet shall be polished chrome plated brass with vacuum breaker spout, wall flanges, pail hook, wall support, .75 inch thread outlet, 2.5 inch metal handles and 8 inch centerset. Faucet shall be Chicago Faucets 897, or equal.

N. Hose Bibb, HB-1

1. Hose Bibb shall be rough brass with 3/4 inch inlet, removable AT@ handle, 3/4 inch male hose outlet, and atmospheric vacuum breaker. Hose Bibb shall be Chicago Faucets 15T-E27, or equal.

O. Hose Bibb HB-2

1. Hose box shall be stainless steel, satin finish, with removable door, cylinder lock, removable loose key handle, screwdriver stop, 3/4 inch inlet, 3/4 inch male hose outlet, and vacuum breaker. Hose box shall be Acorn 8121, or equal.

P. Floor Sink, FS-1

1. Floor sink shall be 3 inch, cast iron, 12.5 inch square, 8 inch deep, with acid resistant coated interior, acid resistant coated 2 grate, aluminum sediment bucket, and trap primer. Floor sink shall be J.R. Smith 3431-12, or equal.

2. Flashing material, when required, shall be Nobleflex chlorinated polyethylene drain flashing, or equal.

Q. Floor Drain, FD-1

1. Floor drain shall be 2 inch, cast iron, adjustable, with 5 inch square nickel bronze strainer & trap primer as indicated. Floor drain shall be J.R. Smith 2010, or equal.

2. Flashing material, when required, shall be Nobleflex chlorinated polyethylene drain flashing, or equal.

R. Floor Drain, FD-2

1. Floor drain shall be 3 inch, cast iron 12X12 inch, 10 inch deep, adjustable, with nickel bronze strainer, sedimentation bucket and trap primer connection. Floor drain shall be J.R. Smith 3440, or equal.

2. Flashing material, when required, shall be Nobleflex chlorinated polyethylene drain flashing, or equal.

S. Trench Drain TD-1

1. Flashing material, when required, shall be Nobleflex chlorinated polyethylene drain flashing, or equal.

2. Trench drain system shall be presloped polyethylene channels, positive seal, tong & groove interlocking joints, 6 inch wide by 6 inch deep with class E grating. Trench drain shall be J. R. Smith Enviro-Flo model 9931, or equal.

T. Roof Drain, RD-1

1. Roof drain shall be low profile with cast iron body and 8-1/2 inch diameter dome. Outlet size shall be as shown on drawing. Roof drain shall be J.R. Smith 1330, or equal.

2. Flashing material shall be Nobleflex chlorinated polyethylene roof drain flashing, or equal.

2.3 EQUIPMENT

A. Protection: All equipment shall be protected against damage during storage and installation.

A. Water pressure Reducing Valve: Pressure reducing valve shall be capable of reducing water pressure from 100 PSI to 50 PSI, and shall be approved by the San Diego Water Utilities Dept. PRV valve shall be Watts 223, or equal.

B. Gas Pressure Regulator, PR-1: Gas pressure regulator shall be pilot-operated with the low pressure pilot integrally mounted to the actuator. The pressure regulator shall have a steel body with screwed ends, a nylon disk, and sized to meet the pressure and flow requirements specified on the drawing. Pressure regulator shall be Fisher type 99, or equal.

C. Trap Primer, TP-1: Trap primer shall be automatic, with bronze body, integral vacuum breaker, and shall have a distribution unit when serving more than one drain. Trap primer shall be J.R.Smith 2699, Zurn Z-1022, Precision Products model P-1, or equal.

D. Circulating Pump, CP-1: Circulating pump shall be designed for domestic water service with 3/4 inch flanged ends, 1/6 hp, and 10 GPM flow at 16 ft. head.

E. Expansion Tank, ET: Expansion tank shall be approved for potable water, and shall be Amtrol Inc. ST-30V, or equal.

2.4 PIPING

A. Sanitary Sewer and Vent Piping

1. All soil, waste, and vent piping material and fittings within building and within 5 feet of building boundary shall be cast iron, hubless, per CISPI 301 & IAPMO IS 6, using stainless steel clamps and shield assemblies per CISPI 310.

2. Cleanouts for Finished Floors: All soil and waste piping cleanouts in finished floor areas shall be cast iron with a round, adjustable, non-skid nickel bronze top, and tapered bronze threaded plug with raised square head or approved counter-sunk rectangular slot. Cleanouts shall be J.R. Smith 4023, or equal.

3. Cleanouts for Finished Floors: All soil and waste piping cleanouts in finished floor areas shall be cast iron with a square, adjustable, non-skid nickel bronze top, and tapered bronze threaded plug with raised square head or approved counter-sunk rectangular slot. Cleanouts shall be J.R. Smith 4043, or equal.

4. Cleanouts for Unfinished Floors: All soil and waste piping cleanouts in unfinished floor areas shall be cast iron with a round, adjustable top, and tapered bronze threaded plug with raised square head or approved counter-sunk rectangular slot. Cleanouts shall be J.R. Smith 4223, or equal.

5. Cleanouts for Outside: All sewer/drain piping cleanouts outside of building shall be cast iron with ribbed ferrule and tapered bronze threaded plug with raised square head or approved counter-sunk rectangular slot. Cleanouts shall be protected with a pre-cast concrete box with an iron lid, marked "SEWER". Cleanouts shall be J.R. Smith 4283-RHP, or equal. Box shall be San Diego Pre-cast Concrete, Brooks 3-T, or equal.

6. Test Tees and Wall Cleanouts: All test tees and wall cleanouts shall be of an approved type. Plugs shall be tapered, threaded bronze and shall have a raised square head or approved counter-sunk rectangular slot.

B. Rainwater Piping

1. All rainwater piping within building and within 5 feet of building boundary shall be cast Iron, hubless, per CISPI 301 & IAPMO IS 6, using stainless steel clamps and shield assemblies per CISPI 310.

C. Condensate Drain Piping

1. All air conditioning condensate drain piping material and fittings shall be copper, hard drawn, type M per ASTM B 88 and IAPMO IS 3 with cast solder- joint fittings per ANSI B 16.23, or wrought solder-joint fittings per ANSI B 16.29. Solder shall be ASTM B 32, 95-5 tin-antimony or grade Sn96 tin-solder.

D. Domestic Hot and Cold Water Piping

1. All hot and cold water piping within building and within 5 feet of building boundary shall be copper, hard drawn, type "L" conforming to ASTM B 88 with cast solder joint fittings per ANSI B 16.18, or wrought solder joint fittings per ANSI B 16.22. Fittings shall be brazed with a silver base brazing alloy or soldered with a lead-free solder and using a non-corrosive type flux.

2. All water piping outside building, below grade, shall be copper, type AK@, conforming to ASTM B 88, with cast solder joint fittings per ANSI B 16.18, wrought solder joint fittings per ANSI B 16.22, or ANSI B 16.26 flared joint fittings. Solder joint fittings shall be brazed with a silver base brazing alloy or soldered with a lead- free solder and using a non-corrosive type flux.

3. Shut off valves 2-inch and smaller shall be 3 piece, full port, bronze ball type, bronze trim, teflon seals, 600 psig WOG, with threaded or solder end joints as required. Valves shall be Nibco S-595 series, Apollo 82 series, or equal.

4. Shut off valves 2-1/4 inches and larger shall be butterfly type, full lug, with ductile or cast iron body, dry stainless steel stem, bronze disc, EPDM elastomeric seat, not less than 10-position throttling handle or infinite stops with memory stop, and 150 psig WOG. Valves shall be Nibco LD-2000, Keystone 129, or equal.

5. Globe valves 2-inches and smaller shall have a bronze body with rising stem, teflon disc, renewable seat and disc, screw-in bonnet, 200 psi WOG, and threaded or solder end joints as required. Valves shall be Nibco T-211-Y or S-211-Y, Stockham B-13-T or B-14-T, or equal.

6. Check valves 2-inches and smaller shall have a bronze "Y" pattern body swing check valve, bronze disc, screwed cap, 200 psi WOG, with threaded or solder end joints as required. Valves shall be Nibco T-413-B or S-413-B, Stockham B-309, or equal.

7. Unions 3-inches and smaller shall be all bronze with ground joint and 400 pound WWP.

8. Nipples shall be red brass.

E. Fuel Gas Piping

1. Gas piping above grade shall be black steel, schedule 40 per ASTM A 53 or ASTM A 120 with malleable iron screw joint fittings conforming to ANSI B16.3 and/or black steel welding fittings conforming to ANSI B16.9.

2. Gas piping below grade shall be polyethylene per ASTM D 2513 and IAPMO IS 12 with heat fusion fittings per ASTM D 2513 and ASTM D 3261. Piping shall be marked per IAMPO IS 12-93 and shall indicate the manufacturers name, nominal pipe size, designation code, "SDR" number, and the words "GAS PIPING" over the complete length of pipe.

3. Gas Cocks 2-inch and smaller shall be all bronze, flat head for gas service, Crane No. 270, Walworth No. 590, or equal. Gas cocks 22-inches and larger shall be for 175 lb. WWP, lubricated square head, ACF No. R-1430, Nordstrom No. 142, or equal.

F. Compressed Air Piping

1. Compressed air piping shall be black steel, schedule 40, seamless or electric resistance welded, ASTM A 53. Fittings shall be threaded malleable iron per ANSI B 16.3 Class 150, or 3000-pound socket welding forged carbon steel or 2000-pound threaded forged carbon steel per ANSI B 16.11.

2. Compressed air shut-off valves 2-inches and smaller shall be class 150, gate type, with bronze body, wedge disc, rising stem, union bonnet, and threaded end connections per MSS SP-80. Valves shall be Nibco T-134, Stockham B-120, or equal.

3. Compressed air outlets shall be a brass tubular valve quick disconnect type, with push type connection, male pipe thread, Buna-N seal, and pawl type locking device. Outlets shall be Schrader Bellows "Saflomatic", or equal.

2.5 ACCESSORIES

A. Access Panels

1. Access Panels for Valves and Equipment: Wall and ceiling access panels shall have a minimum of 16 gauge doors, with continuous, concealed, fire-rated hinges. Panels shall be paintable and sized suitable for removal or repair of valves or equipment, but not less than 8 inches by 8 inches for hand holes and 20 inches by 24 inches for scuttle holes. Access panels shall be J.R. Smith 4762 series for tile, masonry or dry wall construction, and J.R. Smith 4767 series for plaster or wet wall construction, or equal.

2. Access Covers for Cleanouts: Access covers for walls shall be, 8 inches by 8 inches. Access panels shall be J.R. Smith 4730 series for tile, masonry, or dry wall construction, and 4735 series for plaster or wet wall construction, or equal.

B. Pipe Sleeves: Pipe sleeves shall be schedule 40 galvanized steel pipe.

C. Dielectric Unions: Dielectric unions shall be Epco, V-Line, or equal.

D. Sealant: Sealant shall be silicone rubber, except at fire rated penetrations, sealant shall be Dow Corning 785/5, General Electric SCS 1702, or equal.

E. Insulation

1. General: All insulation and covers shall have a UL flame spread not higher than 25 and a smoke developed rating not higher than 50.

2. Air Conditioning Condensate Piping: All copper condensate piping located inside of building shall be insulated with 2 inch thick flexible cellular foamed plastic insulation having not more than a 0.28 K factor at 75 degrees f mean. Insulation shall be Thermo-Cel, Armstrong, or equal.

3. Hot Water Piping: All hot water piping and fittings above ground shall be insulated with preformed fiberglass pipe insulation with "ASJ" jacket. Thickness shall be per Table 1-G of the 1992 California Energy Commission Energy Efficiency Standard. Pipe insulation shall be Schuller "Micro-Lok", or equal. Fitting covers shall be Schuller "Zeston 2000 pvc" with insert, or equal. Joints shall be sealed per manufactures instructions.

4. Exposed Waste Pipe: All exposed waste piping under lavatories, accessible to physically handicapped shall be insulated with prefabricated trap insulation. Insulation shall be Truebro Inc "Handi Lav-Guard ", or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. All work shall be performed by skilled mechanics, under the supervision of a competent foreman and in accordance with the highest standards of practice of the trade.

B. All openings in pipes, fittings, fixtures, or equipment shall be capped at the end of each work day. All materials, fixtures, and equipment shall have ample protection to prevent damage during construction.

C. Access panels shall be provided for all valves, cleanouts, and other equipment which is concealed in floors, walls, or ceilings.

D. The contractor shall be responsible for all damage to any part of the premises or its contents caused by leaks, breaks in piping, fixtures, or equipment furnished and/or installed by contractor for a period of one year from the date of acceptance of the work by the owner or his representative.

E. Fixtures or equipment with damaged finish shall be removed and replaced with new fixtures/equipment at the contractor's expense.

3.2 FIXTURE/EQUIPMENT INSTALLATION

A. Fixture Setting: All fixtures shall be anchored and set level and square in relation to wall and floor lines, and shall be installed with equal spacing where applicable. Voids between fixtures and walls/floors shall be filled with Dow Corning No. 780, white mastic cement. The contractor shall be responsible for correct fixture locations.

B. Equipment Setting: All equipment shall be braced or anchored to resist a horizontal force in any direction using the following criteria: a) 30% of operating weight for fixed equipment on grade, b) 45% of operating weight for fixed equipment on structure.

C. Drain Strainers: All drain strainers, unless otherwise specified, shall be set parallel to adjacent wall.

D. Electrical Work: See Electrical Section for all electrical work associated with the installation of equipment.

3.3 PIPING INSTALLATION

A. Workmanship: All piping, except as shown otherwise on drawings, shall be run concealed in furred walls, partitions, furred ceilings, etc. Prior to installation each piece of pipe and each fitting shall be inspected inside and outside to assure that there are no defects or obstructions. Threaded joints shall be assembled with an approved pipe joint compound applied to male thread only with not more than two threads left exposed.

B. Excavation: The Contractor shall be prompt in installing all piping after excavation or cutting for same, so as to keep all excavations for this work open as short a time as possible. No piping, however, shall be permanently closed up, furred in or covered before inspection and approval of same by the Owner's representative.

C. Bushings: No bushings or close nipples shall be used. Reducing fittings and shoulder nipples shall be used in all cases.

D. Pipe Preparations: Copper tubing/pipe shall be cut square and ends shall be reamed to full size with all burrs removed. Tubing pipe ends and fitting sockets shall be burnished with emery cloth or wire brush before a uniform coat of non-corrosive type flux is applied.

E. Pipe Runs: Pipe runs shall be made with full pipe lengths using a minimum of joints. All piping shall be accurately cut to length. No piping shall be forced or sprung into place. All off-sets shall be made with fittings. Bending of pipe is not allowed.

F. Pipe Support: Piping shall be supported at each change of direction, at ends of branches, at base and at top of all risers, and wherever necessary to prevent sags, bending, or vibration of the piping. Pipe hangers and supports shall be selected as specified in Manufacturers Standardization Society of Valve and Fittings Industry (MSS) standard SP-69.

G. Pipe Isolation: All piping shall be isolated from the building with 1/4 inch hair felt between pipe hangers/supports, pipe insulators, and suspension clamps.

H. Pipe Sleeves: All piping passing through concrete/masonry floors and walls, or fire rated partitions shall be provided with standard weight steel pipe sleeves as follows:

1. All sleeves through floors above grade shall extend 1 inch above floor line.

2. All sleeves shall have 1 inch minimum clearance between the sleeve I.D. and the pipe or pipe insulation.

3. Clearance between sleeve and piping in fire rated walls, floors, or partitions shall be sealed with Underwriters Laboratories listed and Factory Mutual approved sealant. Thickness shall be as recommended by the manufacturer for the designated fire rating. Sealant shall be 3M Brand Fire Barrier Sealing System, Dow Silicone RTV foam, or equal.

4. Clearance between sleeve and piping in non-fire rated walls, floors, or partitions shall be sealed with oakum, or equal.

I. Connections: All pipe connections to fixture/equipment that requires reduction in size shall be reduced just prior to connection.

J. Escutcheons: All pipes passing through walls, floors, and ceilings in finished areas shall have chrome plated steel/brass escutcheons.

K. Sanitary Drain and Rainwater Systems

1. Install soil, waste, rainwater, and vent piping to all outlets as shown on drawings. Piping shall be supported and strapped in an approved manner. Sanitary piping in and under the building shall run to a uniform grade. Contractor shall verify the point of connection as shown on drawings regarding invert elevation and location before starting work. Waste lines shall not penetrate shear wall top and bottom plates.

2. Drains: All drains installed not on grade shall incorporate a clamping collar and flashing. Flashing shall extend 8 inches out in all directions.

3. Interior Clean Outs: Interior cleanouts shall be installed where indicated and as required by code. Cleanouts shall be accessible, and where possible, shall be brought to grade and set flush with finished floor. Horizontal drainage piping shall be provided with cleanouts at its upper terminals, at changes in pipe sizes and not over 100 feet apart in any lineal run of piping.

4. Exterior Cleanouts: Exterior cleanouts in concrete or asphalt areas shall set flush with grade or paved area. Cleanouts in earth shall be extended to within 6-inches of finished grade and terminated in a concrete box set level with finished grade. Clean out plugs shall be liberally lubricated with graphite, turned tight and backed off slightly.

L. Sanitary Vent System

1. Vents shall be connected together in attic spaces or walls where practical to penetrate roof as few times as possible. Vents shall not penetrate top plates or structural beams but shall offset around them. All vents through roof shall be flashed.

2. Vent Termination: All vents and flue outlets shall be a minimum of 10 feet from all fresh air intakes.

3. Air Conditioning Condensate System: Install condensate drain piping from air conditioning units to receptors as shown on the drawings. Piping installed on the roof shall be set on redwood blocks, six-foot on centers, set in mastic.

M. Domestic Water System

1. Install water piping to all fixtures, hose bibbs, etc., as shown on drawings. All branches to fixtures shall be valved. Single fixtures and lines to hose bibbs shall be valved. Where supplies are concealed, or where indicated, loose-key stops shall be installed. Drop ear fittings with red brass nipples shall be provided at all outlets.

2. Slope: All water piping shall be graded and valved to provide for drainage control of the system.

3. Noise: Water piping shall be installed so as to not cause noise from flow of water under normal conditions.

4. Isolation: Copper lines shall be isolated from all dissimilar metal and equipment with dielectric couplings. Dielectric couplings shall be used for all connections between pipe or tubing and all hot water equipment inlets and outlets.

N. Fuel Gas System

1. Install gas piping from gas meter to all outlets as shown on drawings. Provide a gas cock at each outlet.

2. Piping: Gas Piping, concealed or exposed, shall be installed in a neat appearing manner, parallel or perpendicular to building lines. All gas piping shall have threaded fittings.

3.4 TESTING

A. General: Operational test shall be conducted on all fixtures, equipment, and devices installed, to determine proper compliance with specifications. All fixtures, equipment, and devices shall function quietly, efficiently, and undue noise or vibration caused by piping, equipment, etc, shall be promptly corrected before acceptance.

B. Sanitary Drain and Rainwater System: All sanitary drain, vent and rainwater piping shall be hydrostatically tested to a minimum of a 10 foot head above the head at the highest inlet. Pressure shall be maintained for a minimum of (1) hour. The system shall have no leaks.

C. Domestic Water System: Prior to disinfection and installation of pipe insulation, all domestic water piping shall be hydrostatically tested at 125 psig at the highest outlet for minimum of four (4) hours. Any equipment or fixtures that may be damaged by the test should be disconnected. No perceptible gauge loss shall be allowed except for temperature change.

D. Natural Gas System: All natural gas piping shall be tested with compressed air at 60 psig minimum with no perceptible drop in pressure. Test shall be made with a recording gauge. Test shall be for at least 24 hours. Charts shall include date and time test was started, identification of journeyman responsible for the test, and the signature of the inspector.

3.5 CLEANING

A. Disinfection of Portable Water System

1. General: New or repaired potable water systems shall be disinfected prior to use whenever required by the Administrative Authority. The method to be followed shall be that prescribed by the health authority or, in case no method is prescribed by them, the following:

2. The pipe system shall be flushed with clean, potable water until only potable water appears at the point of outlet.

3. The system or parts thereof shall be filled with a water-chlorine solution containing at least fifty (50) parts per million of chlorine and the system or part thereof shall be valved-off and allowed to stand for twenty-four (24) hours, or, the system or part thereof shall be at least two hundred (200) parts per million of chlorine and allowed to stand for three (3) hours.

4. Following the allowed standing time, the system shall be flushed with clean, portable water until the chlorine residual in the water coming from the system does not exceed the chlorine residual in the flushing water.

5. The procedure shall be repeated if it is shown by bacteriological examination made by an approved agency that contamination persists in the system.

END OF SECTION

SECTION 23 00 00

HVAC EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. The work under this section includes the furnishing of all labor material, and equipment, and performing all operations in connection with heating, ventilating and air conditioning work, as shown and specified.

B. The work includes but is not necessarily limited to:

1. Variable Refrigerant Volume system
2. Exhaust Fans
3. Ductwork & Accessories
4. Air Distribution
5. Refrigerant Pipe & Accessories
6. Thermal Insulation

1.02 REFERENCE TO OTHER SECTIONS

A. The applicable requirements from the following Sections shall form a part of the heating, ventilating and air conditioning (HVAC) work and the Contractor shall consult them in detail for general and specific requirements.

Section 22 00 00	Plumbing
Section 23 03 00	Basic Mechanical Requirements
Section 23 05 93	Testing, Adjusting & Balancing for HVAC Systems
Section 23 09 23	Building Automatic Systems
Section 23 35 00	Overhead Vehicle Exhaust Removal Systems

PART 2 PRODUCTS

2.01 GENERAL

A. All material and equipment used in the installation shall be new and in perfect condition when installed. Material, equipment and components shall be the standard catalog product of reputable manufacturers regularly engaged in the manufacturing of such equipment. All articles provided for the same general purpose or use shall be of the same make. Submittal of any equipment for approval shall specifically indicate any item that does not meet the specification. If approval is given when such items have not been listed, removal of the equipment may be required.

2.02 VARIABLE REFRIGERANT VOLUME – OUTDOOR UNIT

A. General: The outdoor unit is designed specifically for use with VRV series components.

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 a Daikin scroll compressor, motors, fans, condenser coil, electronic expansion valve, solenoid valves, 4 way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receivers and accumulators.
2. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.
3. The outdoor unit can be wired and piped with outdoor unit access from left, right, rear or bottom.
4. The connection ratio of indoor units to outdoor unit will be 50% to 130%.
5. The sound pressure dB(A) at rated conditions shall be a value of 58 decibels at 3 feet from the front of the unit. The outdoor unit shall be capable of operating at further reduced noise during night time.
6. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for re-programming.
7. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
8. 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. 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. Oil recovery cycle shall be automatic occurring 1 hour after start of operation and then every 6 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.

B. Unit Cabinet:

1. The outdoor unit model REYQ96MTJU shall be completely weather proof 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 propeller type, direct-drive fan 750 W motors that have multiple speed operation via a DC inverter.
2. The condensing unit fan motor shall have multiple speed operation of the DC inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG with available by field setting switch to a maximum 0.24 in. WG pressure.
3. The fan shall be a vertical discharge configuration with an air flow of 7,400 cfm.
4. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
5. The fan motor shall be provided with a fan guard to prevent contact with moving parts.

D. Condenser Coil:

1. The condenser coil shall be manufactured 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 exchanger, rifled bore tube design to ensure highly efficient performance.
3. The coils shall be complete with corrosion treatment of an acrylic resin type. The thickness of the coating must be between 2.0 to 3.0 microns.

E. Compressor:

1. The Daikin scroll compressor shall be variable speed (PAM inverter) controlled which is capable of changing the speed to follow the variations in total cooling load as determined by the suction gas pressure as measured in the condensing unit.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC, hermetically sealed scroll type with a maximum speed of 6,480 rpm.
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 14% to 100%, with 29 individual capacity steps. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
6. Oil separators shall be standard with the equipment together with an oil balancing circuit.
7. The compressor shall be mounted to avoid the transmission of vibration.

F. Electrical:

1. The power supply to the outdoor unit shall be 208/230 volts, 3 phase, 60 hertz with a voltage range from 187 volts to 253 volts.
2. The control voltage between the indoor and outdoor unit shall be 16VDC non-shielded 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.

2.03 VARIABLE REFRIGERANT VOLUME – BRANCH SELECTOR

A. General: The BSVQ36MVJU and BSVQ60MVJU branch selector boxes are designed specifically for use with VRV series heat recovery system components.

1. These selector boxes shall be factory assembled, wired, and piped.
2. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of rated capacity.
3. These BSVQ branch controllers must be run tested at the factory.
4. These selector boxes must be mounted indoors.
5. When simultaneously heating and cooling, the units in heating mode shall energize their sub cooling solenoid valve.

B. Unit Cabinet:

1. These units shall have a galvanized steel plate casing.
2. Each cabinet shall house multiple refrigeration control valves and a liquid gas separator.
3. The cabinet shall contain a tube in tube heat exchanger.
4. The unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.

C. Refrigerant Valves:

1. The unit shall be furnished with a 3-way refrigerant valve to control the direction of refrigerant flow.
2. Electronic expansion valves shall be used to control the variable refrigerant flow.
3. The refrigerant connections must be of the flare type.
4. Each circuit shall have at least one (36,000 Btu/h fan coil unit or smaller for the BSVQ36MVJU and 60,000 Btu/h fan coil unit or smaller for the BSVQ60MVJU) branch selector box.
5. Two circuits may be connected to a branch selector box with the use of a REFNET joint provided they are within the capacity range of the branch selector.

D. Drainage:

1. The unit shall not require drainage.

E. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
2. The unit shall be capable of operation within the limits of 187 volts to 255 volts.
3. The minimum circuit amps (MCA) shall be 0.2 and the maximum fuse amps (MFA) shall be 15.
4. The control voltage between the indoor and outdoor unit shall be 16VDC non-shielded 2 conductor cable.

2.04 VARIABLE REFRIGERANT VOLUME – INDOOR UNIT

A. General: Daikin indoor unit FXMQ shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R410A, equipped with an electronic expansion valve, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be available from 30,000 Btu/h to 48,000 Btu/h capacities. Model numbers are FXMQ30MVJU, FXMQ36MVJU and FXMQ48MVJU to be connected to outdoor unit model RXYQ / RXYMQ heat pump and REYQ heat recovery model. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height (15-3/8") cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to maintain room temperature within 1°F. The unit shall be equipped with a programmed drying mechanism that dehumidifies while inhibiting changes in room temperature when used with Daikin remote control BRC1C71 and BRC2A71. The indoor units sound pressure shall range from 41 dB(A) to 45 dB(A) at low speed measured 5 feet below the ducted unit.

B. Indoor Unit:

1. The Daikin indoor unit FXMQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, 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 unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. The indoor units shall be equipped with a return air thermistor.
5. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
6. The voltage range will be 253 volts maximum and 187 volts minimum.

D. 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.
3. Optional high efficiency air filters are available for each model unit.

E. Fan:

1. The fan shall be direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range 0.21, 0.36 and 0.58 HP respectively.
3. The air flow rate shall be available in high and low settings.
4. The fan motor shall be thermally protected.

F. 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. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1-1/4 inch outside diameter PVC.
5. A thermistor will be located on the liquid and gas line.

G. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor and remote controller shall be a maximum distance of 1,640 feet.

H. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with connection to LonWorks networks or interfacing with connection to BMS system. Consult with Daikin prior to applying controls.

I. Accessories Available:

1. A high efficiency air filter, 65% efficiency.
2. A high efficiency air filter, 90% efficiency.
3. A condensate pump.

2.05 EXHAUST FANS – ROOF MOUNTED:

A. Exhaust fan shall be factory assembled, low silhouette, steel housing for curb mounting on roof and shall be completely weatherproofed. Exhaust fan shall have physical arrangement and capacity shown on drawings. Unit shall be Greenheck, or equal.

B. Wheel shall be backwardly inclined, centrifugal type, constructed of steel or aluminum and have been statically and dynamically balanced.

C. Housing shall be designed for curb mounting with the motor installed in a totally enclosed weatherproof compartment outside of air stream.

D. Drive shall be belt driven as shown on drawings. Motor shall be in accordance with this section.

E. Accessories shall include backdraft damper, bird screen over entire air outlet of fan, and prefab roof mounting curb.

F. Rating shall be in accordance with the appropriate AMCA approved test codes and procedures and bear the AMCA Certified Rating Seal.

2.06 MOTORS

A. Motors shall be built to the specification of NEMA. The motor shall be ball bearing, drip proof, squirrel cage induction type, to operate at speeds not to exceed 1,750 rpm, except when indicated otherwise. The motors shall operate at current listed on the drawings. Motors mounted outdoors shall be totally enclosed (TEAO). The minimum service factor shall be designed to operate in ambient temperatures up to 150 degrees F. All single-phase motors shall have built-in thermal overload protection. Motors of one horsepower and above, which are not part of a hermetically sealed system, shall be Premium Efficiency type as defined by NEMA Test Standard MG112.53A (IEEE-112 Test Method B), using segregated loss determination.

B. Starters shall be across- the line or part winding type, as required, with overload protection on all legs, and shall be manual or magnetic. Starters shall be complete with NEMA type 1 enclosure, with built-in “Hand-Off-Automatic” switch. Magnetic starters exposed to weather shall have NEMA IV enclosure.

2.07 AIR DISTRIBUTION

A. Ceiling supply diffusers shall be multiple-core construction with core modules removable and rearrangeable to adjust direction of throw on any portion of the diffuser. Diffuser shall be adapted to a filler panel assembly for inverted T-bar installation with perforated face panel and surface mounted type as indicated on the drawings. Diffusers shall be Krueger, Price, Titus or equal.

B. Sidewall supply air registers shall be double deflection type with horizontal front blades. Construction shall be steel. Registers shall be Krueger, Price, Titus or equal.

C. Return and exhaust air registers and grilles shall have horizontal blades at 3/4 inch centers. Return registers shall be adapted for inverted T-bar installation or surface mounted type as indicated on drawings. Construction shall be steel. Registers and grilles shall Krueger, Price, Titus, or equal.

D. Diffusers, grilles and registers size, capacity and throw shall be as indicated on the drawings.

E. All supply diffusers, grilles and registers shall be fitted with extractor or deflector at all takeoff connections from ducts.

F. Factory applied finish shall be white baked enamel.

2.08 REFRIGERANT PIPING AND ACCESSORIES

A. Material and dimensional requirements for field-assembled refrigerant piping valves, fittings and accessories shall conform to ASHRAE 15 & 34. Provide components as recommended by the equipment manufacturer.

B. Provide seamless copper tubing, hard drawn, Type “L” for the liquid, suction and discharge gas lines. Provide solder joint fittings with brazing filler material. When cutting copper piping, pipe needs to be clean and reamed of all burs and debris prior to Brazing. When brazing copper piping Nitrogen must be used during the Brazing process to prevent oxidation and in compliance with equipment manufacturer’s literature and recommendations - typical for all.

C. Line test pressure for Refrigerant R-410A:
   1. Suction Lines for Air-Conditioning Applications: 300 psig.
   2. Suction Lines for Heat-Pump Applications: 535 psig.
   3. Hot-Gas and Liquid Lines: 535 psig.

2.09 DUCTWORK AND ACCESSORIES

A. All ducts shall be prime quality, galvanized steel and shall be lock-forming quality (LFQ) with a galvanized coating of 1-1/4 ounces total for both sides of 1 square foot of sheet. Round ducts and fittings shall be galvanized steel of spiral construction. The elbows shall be a minimum of 1.5 times the duct radius.

B. Flexible duct shall be factory fabricated assembly, consisting of a galvanized spring steel wire helix, covered with a continuous non-perforated air sealed liner, wrapped with glass fiber insulation, 1-1/2" thick (K = 0.25 @ 75 degrees F). The assembly shall be enclosed in a Class 1, fire resistive, vapor barrier jacket, factory sealed at both ends. Individual lengths of flexible ducts shall be a maximum of seven feet long and shall include factory fabricated steel collars.

C. Duct connections to fans, blowers and air handling units shall be made with flexible duct connector of approved design, with a minimum distance of 2 inches between ducts and fans, and minimum 1/2 inch slack in flexible material. Flexible connectors shall be heat-resistant and waterproof glass fiber with a non-porous fire-resistant neoprene coating (both sides). Material shall be approved by State of California Fire Marshal and Underwriter's Laboratories. Connection shall be easily removable with an ordinary screwdriver. Connections shall be Ventglass, Ventfabrics, Neoprene by Duro-Dyne, or equal. Flexible material shall overlap minimum 2 inches at seam and shall be closed air tight.

D. Volume dampers shall be manufactured of 16 gauge sheet metal with locking quadrants. Volume dampers shall be opposed blade type. Where dimension of duct exceeds 19 inches by 12 inches, blades shall not be over 8 inches wide. Bearing shall be provided; holes punched in ductwork to serve as bearings will not be accepted. Damper quadrant sizes shall be as follows: Up to 40 square inches shall be 1/4 inch quadrant, up to 18 inches wide by 12 inches high shall be 3/8 inch quadrant, and over 18 inches by 12 inches shall be 1/2 inch quadrant. Dampers shall be caulked in the ducts to avoid by-pass. Damper blade position on all dampers shall be indicated by filing a notch in the exposed operation rod or splitter damper rod. Volume control dampers shall be installed in all branch ducts, whether shown on drawings or not, to allow balancing of the system. Where dampers, frames and blades constitute an obstruction in excess of 15% of the duct area, the duct shall be increased in size to receive the dampers.

E. Duct access doors to all fire dampers shall be insulated access doors, as manufactured by Ventfabrics, Inc., Duro-Dyne, or equal. Doors shall be 24 gauge metal; 18 gauge frame; insulated 1/2 inch fiberglass; covered with 28 gauge metal; with loose pin hinges; and latches. Access doors shall be Ventfabric, Duro-Dyne, or equal. Door frame shall contain felt gasket, and a sponge rubber gasket shall be attached to back of each door frame to insure tight seal between duct and frame. Finish shall be factory applied. Service shall be stenciled on door, e.g., "Fire Damper" in 1/2 inch letters. Size shall be 18 inch by 12 inch where space and duct size permit. On small ducts and in restricted space, 12 inch by 12 inch may be used.

F. Volume damper inaccessible above ceiling and other locations shall be equipped with Ventfabrics No. 666, Duro-Dyne SRC, or equal, concealed type regulator with zinc-plated cover suitable for painting or equivalent instead of the locking damper quadrant specified above.

2.10 INSULATION

A. Duct Insulation

1. All insulation materials shall have flame spread of not more than 25 and a smoke-developed rating of not more than 50.
2. All concealed supply ducts shall be insulated with Manville "Micro Lite", Owens-Corning Fiberglass or equal, fiberglass duct insulation with "FSK" foil skrim kraft vapor barrier facing, factory applied. Insulation shall have an "R" factor of 4.0 minimum.
3. All concealed return ducts shall be insulated as per supply ducts, but vapor barrier facing may be replaced with Class 1 vinyl facings.
4. Ducts and plenums where indicated on the drawings shall be lined with Manville Mat faced "Lina-Coustic" Standard, Owens-Corning fiberglass "Aero Flex", or equal. Lining shall have an "R" factor of 4.0 minimum.

B. Refrigerant Pipe Insulation

1. All insulation materials shall have flame spread of not more than 25 and a smoke-developed rating of not more than 50.
2. Refrigerant piping shall have a thermal conductivity of 0.25 BTH-in/hr ft^2 ^oF and a water vapor transmission of 0.05 perm-inch. Refrigerant piping shall be wrapped with Armaflex FS, or equal.

PART 3 EXECUTION

3.01 GENERAL

A. All work shall be performed by skilled mechanics, under the supervision of a competent foreman and in accordance with the best standards of practice of the trade.

3.02 EQUIPMENT INSTALLATION

A. The installation of AC units, exhaust fans, and other equipment specified or shown on drawings shall be strictly in accordance with the manufacturer's instructions and installation book. All recommendations of manufacturer shall be followed, required clearances maintained, and factory approval secured for each installation. All equipment shall be securely fastened to its base. A copy of the manufacturer's installation and service manual shall be kept with each piece of equipment at all times to determine if the installation meets requirements.

1. All mechanical equipment shall be braced or anchored to resist horizontal force acting in any direction using the following criteria.
   Fixed Equipment on Grade 30% of Operating Weight
   Fixed Equipment on Structure 45% of Operating Weight
2. For Closely Restrained, Flexibly Mounted Equipment, use 2x the above values. Simultaneous Vertical Force, use 1/3 x horizontal force. Where anchorage details are not shown on Drawings for equipment over 500 pounds, the field installation shall be subject to the approval of the Owner's Representative.
3. Seismic Bracing and anchorage of ducts and piping shall be in accordance with sheets 1-48 of "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems", published by SMACNA and approved by Owner's Representative.

B. Air Conditioning Units and Apparatus must be kept covered and clean during construction; required clearances maintained when installed for compressors, motor and filter service; duct connections to units sealed air tight with caulking or canvas and lagging adhesive; condensate drains installed to nearest receptor for all AC Units, drains must be trapped, depth of trap to equal 1-1/2 times system operating pressure.

C. Air Distribution

1. Diffusers, Registers and Grilles in walls or ceilings of plaster or drywall shall be provided with plaster grounds of 24 gauge galvanized steel to receive screws where removable frames are not specified.
2. Terminal Connection to ductwork shall be sealed securely with lagging adhesive and canvas or with caulking compound.
3. Extractors shall be adjusted to even the air flow across the face of the terminal.
4. Visible ducts behind grilles, registers and diffusers shall be painted flat black.
5. Any accessible screws shall have a drop of super glue placed on the thread.

3.03 DUCTWORK INSTALLATION

A. Ductwork fabrication and installation shall conform to the recommendation of the latest edition of the HVAC Duct Construction Standards, as published by the Sheet Metal and Air Conditioning Contractors National Assoc., Inc., (SMACNA). These standards shall govern type of seams and joints, reinforcing and supports, corner closures duct hangers, elbows, turning vanes (use double vane-type), tapers offsets; streamliners, branches from mains, tee connections, register grille and ceiling diffuser connections, volume dampers, access doors in ducts and plenums.

B. Sheet Metal Installation: All necessary allowances and provisions shall be made in the installation of the ducts for the structural condition of the building, and ducts shall be transformed or divided as may be required, and where necessary to do this, the required area shall be maintained. All of these changes, however, shall be approved and installed as directed by the Owner's Representative. During the installation, the open ends of ducts shall be protected to prevent debris and dirt from entering same. Contractor shall install this work in accordance with the approved progress schedule and in cooperation with others, so there will be no delay in other trades.

C. All ducts shall be sealed airtight by covering all duct joints and connections to equipment with a 4 inch minimum width of 6 ounce canvas pasted in with lagging adhesive or high pressure duct sealer. Duct exposed in non-conditioned spaces shall have canvas and lagging painted with aluminum paint to match adjacent galvanized duct. Duct exposed in conditioned spaces need not be sealed.

D. Ducts passing through floors shall be sealed off in an approved manner, preserving both the fire rating of the structure and to prevent air or water leakage or transfer of noise between floors.

E. All supply and return duct seams and joints exposed to weather shall be caulked watertight with acrylic sealant and shall have 4 inch minimum width of 6 ounces canvas pasted on with lagging adhesive.

F. Volume control dampers shall be installed in all branch ducts, whether shown on drawings or not, to allow balancing of system and adjust air quantities to all supply, return and exhaust outlets and outside air intakes. Dampers provided with outlets shall not be used for balancing.

G. Flexible duct shall be installed in a fully extended condition, free of sags and kinks, and, as far as practical, using only the minimum length required to make the connection. Flexible ducts shall be supported independently of the air outlets, and where horizontal support is required, shall be suspended on 36-inch centers with a minimum 3/4 inch wide flat banding material. Connection of flexible duct (termination connections and joints) shall be made with 1/2 inch wide positive locking steel straps.

3.04 INSULATION INSTALLATION

A. Duct Insulation

1. Before installing duct insulation, sheet metal ducts shall be clean, dry and tightly sealed at all joints and seams.
2. Duct wraps shall be cut to "stretch-out" dimensions as provided in manufacturer's instructions, and a 2" piece of insulation removed from the facing at the end of the piece of insulation to form an overlapping staple and tape flap. Install with facing outside so tape flap overlaps insulation and facing at other end. Insulation shall be

tightly butted. If ducts are rectangular, install so insulation is not excessively compressed at duct corners. Seams shall be stapled approximately 6" on center with outward clinching staples then taped. On supply ducts with vapor barrier facing, the tape shall be vapor barrier tape. On return ducts with vinyl facing, duct tape is acceptable. Seal all seams, tears, punctures and other penetrations of the insulation facing with tape, as described above. Where rectangular ducts are 18" or wider, duct wrap shall be secured to the bottom of the duct with mechanical fasteners spaced a maximum of 12" on center.

3. All duct dimensions shown on drawings are net clear inside and shall be increased to accommodate lining.

3.05 ELECTRICAL WORK

A. Items covered under Electrical Section of Work:

1. All power wiring, conduits and connections serving motors, to disconnect switches for control circuits, and to control panels which are equipment mounted.
2. Disconnect switches shall be furnished, installed, wired and connected.
3. Wiring, gutters, junction boxes, outlets and miscellaneous devices shall be furnished, installed, wired and connected.
4. Final power connections to electrical power driven equipment.

B. Items covered under Mechanical Section of Work:

1. All power wiring, conduits and connections serving motors on automatic (temperature) control devices and to control panels which are not factory mounted.
2. All automatic (temperature) control and interlock wiring, regardless of voltage and conduits for same, necessary for proper operation of equipment, shall be furnished, installed, wired and connected. This includes interlock wiring between motor starter, coils, interlocking relays, magnetic contractors, equipment control panels and temperature control devices.
3. Control transformer, push buttons, toggle switches, temperature control devices, etc., shall be furnished, installed, wired and connected.

C. Items covered under both Mechanical and Electrical Section of Work:

1. It shall be the responsibility of both Contractors to provide equipment with the proper electrical characteristics for the electrical service provided. All necessary electrical components to provide a complete system shall be furnished.

3.06 TEST AND BALANCE

A. The Mechanical Contractor shall in general, cooperate with the Test and Balance Agency and specifically Paragraph 1.07 of Section 15990 of the specifications.

**** END OF SECTION ****

SECTION 23 03 00

BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. This specification and the applicable drawings are intended to define the requirement to furnish all labor, materials, equipment, supplies, and other cost as necessary for the satisfactory completion of all work pertaining to mechanical trades.

1.02 RELATED DOCUMENTS

A. All work shall comply with the requirements of codes, ordinances and regulations of the government having jurisdiction at the location of work, including the regulations of serving utilities.

B. The latest approved editions of the following specifications and standards shall form a part of this specification, the same as if herein written out in full, and all materials and installations shall conform to the applicable requirements thereof:

1. All state and municipal ordinances having jurisdiction
2. California Code of Regulations (CCR), Title 8
3. California Code of Regulations (CCR), Title 19
4. California Code of Regulations (CCR), Title 24
5. National Fire Protection Association (NFPA) Pamphlet No. 13
6. National Fire Protection Association (NFPA) Pamphlet No. 90A & 90B
7. National Electric Code (NEC)
8. Occupational Safety and Health Administration (OSHA) "Safety and Health Regulations for Construction"
9. California Mechanical Code (CMC)
10. California Plumbing Code (CPC)

C. The latest specifications and standards of the following associations shall form a part of this specification, the same as if herein written out in full, and all materials, equipment and installations shall conform to the applicable requirements thereof.

1. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)Underwriters Laboratories, Inc. (UL)
2. Air Moving and Control Association (AMCA)
3. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
4. American Gas Association (AGA)

D. The following Division 22 & 23 Sections shall form a part of this specification.

Section 22 00 00	Plumbing
Section 23 00 00	HVAC Equipment & Systems
Section 23 05 93	Testing, Adjusting, and Balancing for HVAC Systems
Section 23 09 23	Building Automation Systems
Section 23 35 00	Overhead Vehicle Exhaust Removal System

1.03 DEFINITIONS

A. “Piping” shall mean pipes, fittings, valves and all piping specialties that are used in conveying system media.

B. Pressure ratings specified is the design working pressure for the fluid which the device will serve.

C. "Ductwork" shall mean ducts, plenums, compartments, castings, or any like devices, which are used to convey air.

1.04 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 00, if applicable, and as follows.

B. All material and equipment used in the installation shall be new and in perfect condition when installed. Material, equipment and components shall be standard catalog type products from reputable manufacturers regularly engaged in the manufacturing of such equipment. All articles provided for the same general purpose or use shall be the same make. Submittal of any equipment for approval shall specifically indicate any item that does not meet the specification requirements. Removal of installed articles may be required if the article is later found not in conformance with the specification requirements.

C. Space allotted, clearances, access, electrical data, structural supports, etc. shown on drawings is for equipment models and sizes listed in schedules and/or in specifications. Contractor shall verify these conditions on all non-listed equipment submitted for approval.

D. Unless otherwise specifically directed in the applicable Division 22 or 23 sections, the submittals by the Contractor to the Owner's Representative shall be as follows:

1. Submit manufacturer's catalog data for all purchased items, indicating size, model, options, etc, of the item to be used.

2. Submit drawings for non-purchased items that have to be fabricated.

3. Submit shop drawings of ductwork and piping layouts

1.05 PERMITS AND FEES

A. The contractor shall arrange, apply for, and pay for all permits, inspections, fees, and licenses required by any legally constituted public authority for this work.

1.06 DISCREPANCIES

A. Any discrepancies found between the specification and drawings, or between drawings, shall be brought to the attention of the owner or his representative before installation of the applicable item. Special attention shall be given to voltage requirements and lighting arrangements. Any conflict shall be called to the attention of the Owner's Representative immediately. Any extra cost caused by neglecting to verify all listed voltages and phase with electrical plans shall be the responsibility of the Contractor.

1.07 GUARANTEE

A. Contractor shall provide a written guarantee that all materials, fixtures, and equipment installed under the contract are guaranteed for a period of one year from the date of completion. Contractor shall provide all materials and labor necessary for repair, in a reasonable amount of time, and without cost to the owner.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. All mechanical equipment, both hanging and base mounted, shall be provided with mounting connection points of sufficient strength to resist seismic forces, as required by CCR Title 24. The mounting connections shall be compatible with vibration isolation used.

B. Equipment identification number, capacity, and design requirements are specified in the drawing equipment schedule or applicable specification. Equipment furnished and installed shall meet the design requirements at operating conditions with the following parameters:

1. The RPM, motor horsepower, brake horsepower, air pressure drop, water pressure drop, equipment weights, outlet velocities, tip speed and dB ratings specified are maximum. An increase will not be accepted.

2. The CFM, wheel diameters, heating and cooling capacities, and static pressure on fans that are specified are minimums. A decrease will not be accepted.

2.02 RECORD DRAWINGS

A. The contractor shall maintain a complete "as-built" record set of blue line prints during construction. The “as-built” prints shall be used to record the exact location of all piping and ducting installed, including the depth of all underground piping. Upon completion of the project contractor shall deliver a clean set of "as-built" prints to the owner or his representative.

2.03 MANUALS AND INSTRUCTIONS

A. The Contractor shall furnish five sets of Operating and Maintenance Manuals. The information in these manuals shall be bound in a hardback, loose-leaf binder or approved equivalent. Inscribed on the cover shall be the words "OPERATING AND MAINTENANCE MANUAL", the name and location of the building or project, and the name of the Contractor. The following shall be included in the Manual:

1. The names, addresses and telephone numbers of each sub contractor that installed equipment and/or systems, and the local representative for each major item of equipment.

2. Information assembled with tab sheets to conform to a Table of Contents.

3. Manufacturer's literature for all mechanical equipment. All equipment shall be identified by make, model and serial number. Electrical characteristics shall be noted and a complete parts list included.

4. Operating Instructions: Provide a brief description of the system including proper setting of switches and other equipment. This may be provided as part of the manufacturer's literature. If included in literature, provide an index indicating on what page each item is located. Adjustments requiring the technical knowledge of the service agency personnel need not be included.

5. Maintenance Instructions: Provide a list of each item of mechanical equipment requiring inspection, lubrication or service, with a description of the schedule and performance of such maintenance, including types of lubricant for each item of equipment. This may be provided as a part of the manufacturer's literature. If included in literature, provide an index indicating on what page each item is located.

6. Controls: Provide system control drawings including complete catalog data, calibration information, spare parts lists, etc. A typewritten sequence of operation shall be included with the diagrams referring to component numbers or designations thereon. For DDC systems, the computer designation shall be provided for all points installed.

B. Posted Operation Instructions: Operating Instructions shall be provided at all control panels and shall include control diagrams and sequence of operation.

PART 3 EXECUTION

3.01 GENERAL

A. Locations: The locations of the mechanical work and equipment as indicated on the drawings are approximate only, and the required final exact positions shall be verified with the Owner's Representative prior to installation. All changes in locations of equipment shall be subject the approval of the Owner's Representative.

B. Accessibility: All equipment shall be installed so as to be accessible for maintenance and adjustment (crawling under or over ductwork is not acceptable). Special attention shall be given to motors, belts, air filters, manual valves and control valves, operating dampers, coils, etc. This section of specifications shall be responsible for the supplying and installation of all required access panels.

C. Noise and Vibration: It is the intent of the specification and design conditions that the entire system, including equipment, air ducts, piping and all other parts, shall be free of excessive vibrations. If excessive vibration occurs as a result of installation, it shall be the responsibility of the Contractor to correct these conditions at no cost to the Owner.

D. Coordination: Before proceeding with installation of piping and ductwork, Contractor shall inspect the Contract Drawings and determine that the location of the work does not interfere with work of other trades. In case of interference, contractor shall notify the Owner's Representative in writing and his decisions shall govern.

E. Structural Members: Where piping passes through or interferes with slabs, beams or any structural member, or where cutting of structure is required, the Owner's Representative shall be consulted. No cutting of structural members shall be done without approval from the Owner's Representative. When pipes are placed in partitions necessitating cutting of any structural member, metal ties shall be provided, in accordance with applicable structural code.

3.02 EQUIPMENT INSTALLATION

A. Obtain manufacturer's printed installation instructions to aid in properly executing work of installing equipment whenever such instructions are available. Submit three copies of such instructions to the Owner's Representative prior to time of installation for use in supervising the work.

B. All recommendations of the manufacturer shall be followed and required clearances maintained. All equipment shall be securely fastened to its base. A copy of the manufacturer's installation and service manual shall be kept with each piece of equipment, to allow Owner's Representative to determine if the installation meets requirements.

C. Erect equipment in a neat manner such as aligning, leveling and adjusting for satisfactory operation. Install equipment so that connecting and disconnecting of piping and accessories can be made readily, and so that all parts are easily accessible for inspection, operation, maintenance and repair. Minor deviation from arrangements shown on drawings may be made, as approved by the Owner's Representative.

D. Rotating or reciprocating mechanical equipment shall be mounted on or suspended from vibration isolators to prevent vibration and structural borne noise transmission to the building. Refer to each mechanical section of these specifications for details. All vibration isolators shall be pre-approved. Unless otherwise noted, flexible duct connectors shall be used between all fan openings and sheet metal work, and flexible piping connectors shall be used between all rotating mechanical equipment and piping systems.

E. Provide seismic restraints for all mechanical equipment, piping, and ductwork in accordance with CCR Title 24, Part 2, Volume 2, Chapter 16A Paragraph 1615A.

3.03 ADJUSTMENT AND OPERATION OF SYSTEM

A. When the work included in this specification is complete, and at such time as directed by the Owner's Representative, the Contractor shall adjust all parts of the system, advising the Owner's Representative when this has been done and the work is ready for their final tests. Refer to Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC Systems".

B. If it becomes necessary for temporary use of a system before completion, the Contractor shall adjust all parts as far as possible in order to make temporary use as effective as possible. After temporary use and before acceptance tests, all systems shall be readjusted to meet permanent operational requirements.

C. Operation Test: The Contractor shall conduct an operation test to demonstrate that all building systems have been completed and perform in compliance with contract requirements. This test shall be performed under simulated operating conditions for one consecutive twenty-four hour period and may be witnessed by the Owner's Representative at his option.

D. Test Cost and Results: The cost of utilities, material, and qualified operating personnel shall be borne by the Contractor. The Contractor shall provide written notice to the Owner's Representative at least five (5) days prior to starting the test and shall provide a written record of test results using recording type instruments where practical.

E. Verbal Operating Instructions: Upon completion of work, and at a time designated by the Owner's Representative, a competent representative from each supplier of major equipment items shall instruct a representative of the Owner in the operation and maintenance of the equipment supplied by his company. The minimum instruction time shall be one 4-hour period for air handling units, one 8-hour day for chillers, one 4-hour period for pumps and one 8-hour day for temperature control systems.

F. Certification: After completion of air and water balancing operations, the authorized representative for each type of equipment shall check the equipment operation and shall certify that the equipment is operating properly.

3.04 CLEANING OF EQUIPMENT AND PREMISES

A. Contractor shall thoroughly clean all equipment and apparatus and leave in satisfactory condition for finishing and painting. If equipment has been supplied with factory finish, Contractor shall be responsible for touchup work and/or refinishing if required. During construction, contractor shall be responsible for clean up of cartons, scrap or debris caused by his work, and complete cleanup of the area after each day of work.

B. Each air handling system shall be thoroughly cleaned before being put into operation, either by vacuum cleaning or blowing out with a pressure blower.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING & BALANCING FOR HVACSYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. The work in this section includes the adjusting and balancing of all heating, ventilation and air conditioning systems.

B. The General Contractor will select and employ an impartial, independent balancing agency to provide testing and balancing services for the heating, ventilating and air conditioning system of this project. These services will be paid for by the General Contractor. Final approval of the balancing agency shall be the Owner's Representative. The balancing agency will have a contractual relationship with the General Contractor.

C. The schedule for testing and balancing the HVAC systems shall be established by the General Contractor in coordination with the balancing agency. It is the balancing agency's responsibility to initiate this continuing coordination to determine his schedule for the final testing and balancing services and the periodic inspections required during construction.

1.02 REFERENCE TO OTHER SECTIONS

A. The applicable requirements from the following sections shall form a part of balancing of air and water system work and the agency shall consult them in detail for general and specific requirements.

Section 23 00 00	HVAC Equipment and Systems
Section 23 09 23	Building Automation Systems
Section 23 35 00	Overhead Vehicle Exhaust Removal System

1.03 QUALIFICATIONS OF THE BALANCING AGENCY

A. The balancing agency shall be a member of the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB).

B. To perform required professional services, the balancing agency shall have a minimum of one Test and Balance Engineer certified by the Associated Air Balance Council or the National Environmental Balancing Bureau.

C. This certified Test and Balance Engineer shall be responsible for supervision and certification for the total work herein specified.

D. The balancing agency shall submit records of experience in the field of air and hydronic system balancing or any other data as requested by the Owner's Representative. The supervisory personnel for the firm shall have at least two (2) years experience, and all the employees used in this project shall be qualified technician in this specific field.

E. The balancing agency shall furnish all necessary calibrated instrumentation to adequately perform the specified services. An inventory of all instruments and devices in possession of the balancing agency may be required by the Owner's Representative to determine the balancing agency's performance capability.

F. The balancing agency shall have operated for a minimum of two (2) years under its current name.

1.04 STANDARDS

A. The balancing agency shall perform the services specified herein in accordance with the Associated Air Balance Council's or National Environmental Balancing Bureau's NATIONAL STANDARDS, including revisions, to the date of the contract.

B. All terms in this specification shall have their meaning defined as stated in the NATIONAL STANDARDS.

C. If these specifications set forth more stringent requirements than the NATIONAL STANDARDS, these specifications shall prevail.

1.05 DOCUMENTS

A. The Owner's Representative will provide the balancing agency one (1) copy of the following documents:

1. Project drawings (mechanical sepias if requested) and specifications.
2. Approved construction revisions pertaining to the HVAC systems.
3. Approved submittal data on HVAC equipment and systems to be installed by the Mechanical Subcontractor.
4. Approved HVAC shop drawings.
5. Approved HVAC wiring diagrams, control diagrams, and equipment brochures, as appropriate.

1.06 COORDINATION

A. It will be necessary for the balancing agency to perform its services in close coordination with the Mechanical Subcontractor.

B. The plans and specifications have indicated meters, valves, dampers, and other devices for the purposes of adjusting the system to obtain optimum operating conditions. It will be the responsibility of the Mechanical Subcontractor to install these devices in a manner that will leave them accessible and readily adjustable. The balancing agency shall provide guidance if there is a questionable arrangement of a control or balancing device.

C. The General Contractor, Mechanical Contractor, DDC Control Subcontractor, and the suppliers of the HVAC equipment shall all cooperate with the balancing agency to provide all necessary data on the design and proper application of the system components. In addition, they shall furnish all labor and materials required to eliminate any system deficiencies.

1.07 RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR

A. The Mechanical Contractor shall complete the installation and start all HVAC systems to ensure they are working properly, and shall perform all other items as described hereinafter, to assist the balancing agency in performing the testing and balancing of the HVAC systems. The Mechanical Contractor shall put all HVAC systems and equipment in full operation and shall continue the operating of them during each working day of testing and balancing.

B. Air Distribution Systems

1. Verify installation for conformity to design.
2. Terminate all supply, return and exhaust ducts, and pressure test them for leaking, as required by specification.
3. Ensure that all splitters, extractors, and volume and fire dampers are properly located and functional. Dampers serving requirements of minimum and maximum outside, return, relief, and exhaust air shall provide tight closure and full opening, with a smooth and free operation.
4. Verify that all supply, return, exhaust, and transfer grilles; registers' diffusers; and high-pressure terminal units are installed and operational.
5. Ensure that air-handling systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc., are blanked and/or sealed to eliminate excessive by-pass or leakage of air.
6. Ensure that all fans (supply, return, relief, and exhaust) are operating and free of vibration. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protection shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.
7. Make any necessary changes to the sheaves, belts, and dampers, as required by the balancing agency, at no additional cost to the Owner.
8. Install clean filters.

1.08 RESPONSIBILITIES OF THE DDC CONTROL CONTRACTOR

A. The DDC Control Contractor shall complete the installation of the DDC control system, operate and test all control systems to ensure they are functioning properly as designed. The DDC Control Contractor shall assist the balancing agency in testing and balancing the HVAC systems, as described hereinafter.

1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, and damper sequences.
2. Verify that all controlling instruments are calibrated and set for design operating conditions.
3. Calibrate room thermostats after installation, and before the thermostat control verification tests are performed. The balancing agency shall prove the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.
4. The DDC Control Contractor shall allow sufficient time in the project to provide assistance and instruction to the balancing agency in the proper use and setting of control components such as, but not limited to, computers, static pressure controllers, or any other device that may need set points changed, so that the testing and balancing work can be performed.

1.09 NOTIFICATION FOR TESTING AND BALANCING WORK TO BEGIN

A. The General Contractor shall notify the balancing agency in writing when all heating, ventilating, and air conditioning systems are complete and ready for testing and balancing. The Mechanical Contractor shall attest that he has completed all items as described in Section 1.07 of these specifications.

B. If, upon commencing the work, the Balancing Contractor finds that the systems are not ready, or if a dispute occurs as to the readiness of the systems, the balancing agency shall request an inspection to be made by the Mechanical Engineer. This inspection shall establish, to the satisfaction of the represented parties, whether or not the systems meet the basic requirements for testing and balancing. Should the inspection reveal the notification to have been premature, all costs for the inspection and work previously accomplished by the balancing agency shall be paid for by the General Contractor. Furthermore, such items that are not ready for testing and balancing shall be completed and placed in operational readiness before testing and balancing services shall again be requested.

1.10 QUANTITIES

A. In all cases where a device, operation, procedure, tool, equipment, or part of the equipment is herein referred to in the singular number, it is intended that such reference shall apply to as many such devices as required to complete the testing and balancing specified herein.

PART 2 RESPONSIBILITIES OF THE BALANCING AGENCY

2.01 SCOPE

A. In accordance with Project Drawings and Specifications and as specified herein, the balancing agency shall provide all supervision, personnel, instruments, calibration equipment, and all other materials and services necessary to perform all testing and balancing of the heating, ventilating, and air conditioning systems. All test data, including all pertinent calculations, shall be reported on appropriate forms.

2.02 GENERAL

A. The testing and balancing of the heating, ventilating, and air conditioning systems shall be performed by an independent balancing agency approved by the Owner's Representative. The balancing agency shall have a minimum of two years specialized experience in air and hydronic system balancing, and possess calibrated instruments, qualified Test and Balance Engineers, and skilled technicians to perform all required tests. The balancing agency shall be a certified member of the Associated Air Balance Council.

B. The tests shall demonstrate the specified capacities and operation of all equipment and materials comprising the systems. The balancing agency shall then make available to the Owner's Representative such instruments and technicians as are required for spot checks of the system.

C. The balancing agency shall not instruct or direct the Mechanical Contractor in any of the work. Any proposed changes or revision in the design shall be submitted to the Architect and Resident Engineer in writing. The Architect and Resident Engineer shall, in coordination with his Engineer, process the proposal as appropriate.

2.03 SERVICES

A. Preliminary Report: Review plans and specifications prior to installation of any of the affected system. Submit a written report to the General Contractor indicating any deficiencies in the system that would preclude the proper adjusting, balancing, and testing of the system.

B. During construction, the balancing agency shall inspect the installation of pipe systems, sheet metal work, temperature controls and other component parts of the heating, ventilating, and air conditioning systems. The inspections shall be performed periodically as the work progresses. A minimum of two inspections are required as follows: (1) when 60% of the duct work is installed; (2) when 90% of the equipment is installed. The balancing agency shall submit a brief written report of each inspection to the Owner's Representative.

C. Upon completion of the installation and start-up of the mechanical equipment by the Mechanical Contractor, the balancing agency shall test and balance the system components to obtain optimum conditions in each conditioned space in the building. If construction deficiencies are encountered that preclude obtaining optimum conditions, and the deficiencies cannot be corrected by the Mechanical Contractor within a reasonable period of time, the balancing agency shall cease testing and balancing services and advise the Owner in writing of the deficiencies.

2.04 AIR SYSTEM PROCEDURES

A. The balancing agency shall perform the following testing and balancing functions in accordance with the Associated Air Balance Council's NATIONAL STANDARDS:

1. Fan Speeds: Test and adjust fan RPM to achieve design CFM requirements.
2. Current and Voltage: Measure and record motor current and voltage.
3. Pitot Traverse: Perform a Pitot tube traverse of main supply and return ducts to obtain total CFM.
4. Outside Air: Test and adjust system minimum outside air by Pitot tube traverse. If a Pitot tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and mixed air temperatures. Make allowances for heat of compression and motor heat where applicable.
5. Static Pressure: Test and record system pressures, including suction and discharge static pressure of each fan.
6. Air Temperature: Take wet-bulb and dry-bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.
7. Zone Ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
8. Main Ducts: Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
9. Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
10. Tolerances: Test and balance each diffuser, grille, and register to within 10% of design requirements.
11. Identification: Identify the location and area of each grille, diffuser, register, and terminal coil. This information shall be recorded on air outlet data sheets.
12. Description: Record the size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.
13. Minimizing Drafts: Adjust all diffusers, grilles, and registers to minimize drafts in all areas.

2.05 VERIFICATION OF DDC CONTROLs

A. The balancing agency shall be assisted by the DDC Control Contractor in verifying the operation and calibration of all temperature control systems. The following tests shall be conducted:

1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water reset, and ionization detectors.
2. Verify that all controlling instruments are calibrated and set for design operating conditions.
3. Verify the accuracy of the final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.

2.06 TEST AND BALANCE REPORT

A. The Test and Balance Report shall be complete with logs, data, and records as required herein. All logs, data, and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the balancing Agency's certified Test and Balance Engineer.

B. Six (6) copies of the Test and Balance Report are required and shall be submitted to the Owner's Representative.

C. The report shall contain the following general data in a format selected by the balancing agency.

1. Project and Contract Number
2. Project Title and Location
3. Project Architect and Resident Engineer and Mechanical Engineer
4. Test and Balance Agency and Engineer
5. General Contractor
6. Mechanical Subcontractor
7. Dates Tests Were Performed
8. Certification

D. The Test and Balance Report shall be recorded on report forms conforming to the recommended forms in the AABC NATIONAL STANDARDS or NEBB STANDARDS. At a minimum, the report shall include:

E. Preface: A general discussion of the system, any abnormalities and problems encountered.

F. Instrumentation List: The list of instruments including type, model, manufacturer, serial number, and calibration dates.

G. System Identification: In each report, the zones, supply, return, and exhaust openings, and traverse points shall be numbered and/or lettered to correspond to the numbers and letters used on the report data sheets. A single line drawing shall be prepared for each floor or system to cross reference information on the data sheets.

H. HVAC Equipment Test Report Forms: Record the following on each air handling equipment test form:

1. Manufacturer, model number, and serial number.
2. All design and manufacturer rated data.
3. Total actual CFM by traverse; see the AABC NATIONAL STANDARDS or NEBB STANDARDS.
4. Suction and discharge static pressure of each fan, as applicable.
5. Outside air and return air total CFM.
6. Actual operating current, voltage, and brake horsepower of each fan motor.
7. Final RPM of each fan.
8. Fan and motor sheave manufacturer, model, size, number of grooves, and center distance.
9. Belt size and quantity.
10. Static pressure controls final operating set points.

2.07 FINAL ACCEPTANCE

A. At the time of final inspection, the balancing agency shall recheck, in the presence of the Owner's Representative, specific and random selections of data recorded in the certified Test and Balance Report.

B. Points and areas for recheck shall be selected by the Owner's Representative.

C. Measurements and test procedures shall be the same as the original test and balance.

D. Selections for recheck, specific plus random, shall not normally exceed 15% of the total number tabulated in the report, except where special air systems require a complete recheck for safety reasons.

E. If random tests demonstrate a measured flow deviation of 10% or more from that recorded in the certified Test and Balance Report, the report shall automatically be rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, a new certified Test and Balance Report submitted, and a new inspection test made, all at no additional cost to the Owner.

END OF SECTION

SECTION 23 09 23

BUILDING AUTOMATION SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Provide all work for the complete installation of automatic temperature controls.

1. Work in this Section shall include the following primary items:
   a) Electronic and electric controls, includes sensors, switches, relays, control panels for instruments.
   b) Local control panels.
   c) Adjustment and validation of control system.
   d) Instruction of Owner's representative on maintenance and operation of control equipment.
   e) Electric diagrams showing interlocks between equipment furnished under the other sections and control furnished herein.
   f) Direct digital control for systems as indicated on the drawings.
   g) Wiring and Conduit: Low and line voltage for the control system under Division 23, Power Wiring under Division 26.

1.02 SYSTEM

A. The DDC Control System shall be installed as a installed project and shall consist of all sensors, actuators, direct digital controllers, supervisory controller, electrical low voltage (24 VAC) and line voltage control wiring for a complete and operating installation as specified herein. The system shall be a standard product with the manufacturer who will guarantee ongoing parts availability and factory trained field support for five (5) years after system acceptance.

PART 2PRODUCTS

2.01 GENERAL DESCRIPTION

A. Individual Zone Controller – Infrared Zone Controller

1. The infrared zone controller shall be able to control 1 group (maximum of 16 fan coil units).
2. The infrared zone controller shall have the following features:

OPERATION	Start/Stop
	Operation Mode
	Temperature Setting
	60°F – 90°F Set Point Range
	Fan Speed
	Airflow Direction
MONITORING	Status
	Malfunction Flashing
	Malfunction Content
	Operation Mode
	Temperature Setting
	Fan Speed
SCHEDULING	Auto ON/OFF Timer
CONTROL MANAGEMENT	Field Setting Mode
	Group Setting

B. Multi-Zone Controller – Centralized Remote Controller

1. The centralized remote controller shall be able to control up to 64 groups (maximum of 128 fan coil units) and shall be able to function as follows:
   i. The controller shall have a maximum wiring length of 6,560 feet.
   ii. The controller shall have a maximum wiring distance between a controller and any unit of 3,280 ft.
   iii. The controller shall be able to combine with 1 schedule timer and up to 4 unified ON/OFF controllers.
   iv. The controller shall be capable of up to 2 units are connectable within 1 system (up to 4 units in case of the double central control mode).
   v. Applicable wiring methods shall include bus and star, in addition to series type.

PART 3 EXECUTION

3.01 GENERAL

A. All system components and appurtenances shall be installed in accordance with the manufacturer's instructions and requirements. All necessary interconnections, services and adjustments required for a complete and operable system, shall be provided by this contractor.

3.02 INSTALLATION

A. GENERAL

1. Electric Wiring: This contractor is responsible for all low voltage control wiring installation and wire for a fully operational Building Control System as shown on the drawings. Perform all electrical installation in accordance with local and national electrical codes.
2. Install all electronic wiring, 24VDC or less, in No. 20 AWG as a minimum. Provide shields as required by equipment manufacturer.

3.03 EQUIPMENT INSTALLATION

A. Space Thermostat and Sensor Locations: In general, locate thermostats and sensors for room control as shown on drawings at approximately 48 inches from floor. Coordinate thermostat locations with General Contractor and approval by Engineer.

B. Local Control Panels: Mount all local control panels as indicated on the control drawings.

END OF SECTION

SECTION 23 35 00

OVERHEAD VEHICLE EXHAUST REMOVAL SYSTEM

PART 1 GENERAL

1.01 GENERAL CONDITION

A. The contractor shall provide all labor, materials and equipment necessary to working operation a complete system to remove exhaust gases and particulate of operating vehicles within the confines of the apparatus bay. All controls, blowers, ductwork and fittings for a complete project.

B. All workman ship and materials shall be in accordance's with applicable codes regulation, i.e., SMACNA, BOCA, NEC, ASTM, CBC, CMC, NFPA and AMCA.

C. The contractor shall install and guarantee all materials, equipment and workmanship for a period of 5 years from final acceptance of the complete project, against original defects and deterioration. Replacement will be at no cost to the owner.

1.02 SUBMITTALS AND OPERATION MAINTENANCE DATA

A. Submittals shall be made in accordance with Section 01 33 00. All submittals shall be clearly marked or highlighted showing conformance to specifications and schedule. Provide shop drawings indicating all system components and dimensions.

B. Operation and maintenance data shall be in accordance with Section 01 33 00 and shall include instructions for operation, changing and periodic cleaning.

PART 2 PRODUCTS

2.01 SYSTEM SUPPLIER

A. The complete system shall be EVEC System manufactured by Plymovent (www.plymovent.com) or equal.

2.02 AIR MOVING DEVICES

A. The fan shall be direct drive, single width airfoil blade. Fan housing shall be heavy duty steel with rust inhibiting plant. Fan construction shall be AMCA spark resistant.

B. Fan motor shall be type TEFC with permanently sealed bearings.

C. Fan sound generation should not exceed 59 dBA @ 10ft from source.

2.03 CONTROL PANEL

A. All components shall be UL listed. Panel assembly shall be built in accordance to UL 508 standard (CSA/NRTL/UL).

1. Enclosure shall be NEMA 4X water and dust resistant.
2. Motor starter shall be sized to 125% of required capacity.
3. Overload relay shall be adjustable and sized to 125% capacity.

4. Timer shall be solid state fully adjustable from 6 to 600 seconds.
5. Engine pressure switch shall be positive pressure from the vehicle exhaust.
6. Electrical terminal Block 600V.
7. Disconnect switch.
8. Auto/manual switch.
9. Indicator light (On).
10. Transformer.
11. Low frequency receiver/transmitter.

2.04 DUCTWORK SYSTEM ACCESSORIES

A. Shall be spiral pipe sized to handle 8" of static pressure.

B. Duct fittings shall be one even gauge number heavier than ductwork. All 45 & 90 degree fitting shall be 1.5 times the radius. All fitting shall be all welded or stamped.

C. Ductwork velocities shall be 3000 to 3500 fpm with a minimum hose capture velocity of minimum 4400 fpm.

2.05 VEHICLE EXHAUST CAPTURE SYSTEM

A. Scope of operation: For the Evec Systems REC system. The system is designed to capture and remove all particulate from entering the apparatus bay via the vehicle tailpipe. The system is activated by either a positive pressure switch that senses the vehicles exhaust and/or wireless transmitter before the vehicle is started.

2.06 DEVICES AND PARTS

A. REC system consists of the following items.

1. 14 gage galvanized steel formed sheet metal chamber track.
2. TELSPAR telescoping 2" 12 gage square tube with a 1 5/8" square channel.
3. Bracing: ½" all thread rod with ½" nuts, flat washers and lock washers.
4. 45 degree bracing brackets.
5. Galvanized steel foot bracket.
6. Hose retractor.
7. Rollers exhaust trolley.
8. Hose sling.
9. Hose retractor.
10. 12 -1/2 feet long silicone fiberglass two ply hose, with a 600 degree F temperature rating.
11. EPDM rubber tailpipe adapter with two linear magnets.
12. 70 D "Neoprene Rubber" lips.

PART 3 EXECUTION

3.01 INSTALLATION

A. All steel components such as fan wall mounts will be galvanized. All fasteners or fittings to connect EVEC components to the building are to be supplied by the installer.

B. All components shall be installed per manufacturer's installation instructions.

C. No-loss exhaust stacks at fan discharge. Rain cap not permitted.

D. Top of exhaust chamber shall be cleaned at the end of construction.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:
1. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. Alpha Wire.
3. Belden Inc.
4. Encore Wire Corporation.
5. General Cable Technologies Corporation.
6. Southwire Incorporated.
7. Or equal.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Gardner Bender.
3. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. Ilsco; a branch of Bardes Corporation.
6. NSi Industries LLC.
7. O-Z/Gedney; a brand of the EGS Electrical Group.
8. 3M; Electrical Markets Division.
9. Tyco Electronics.
10. Or equal.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

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

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders and Branch Circuits: Copper. Stranded for No. 12 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

D. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

F. Complete cable tray systems installation according to Section 270536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07.

3.8 FIELD QUALITY CONTROL

A. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

B. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Grounding arrangements and connections for separately derived systems.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 01, include the following:

a. Instructions for periodic testing and inspection of grounding features at test wells based on NETA MTS NFPA 70B.

1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

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

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Fushi Copperweld Inc.
4. ILSCO.
5. O-Z/Gedney; A Brand of the EGS Electrical Group.
6. Siemens Power Transmission & Distribution, Inc.
7. Or equal.

2.2 SYSTEM DESCRIPTION

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

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 2 inches (6.3 by 50 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.

C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.6 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 6 inches (150 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Installbonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

H. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect and Resident Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. 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:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Atkore International.
g. Wesanco, Inc.
h. Or equal.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    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:

        1) Hilti, Inc.
        2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.
        5) Or equal.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    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:

        1) Cooper B-Line, Inc.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti, Inc.
        4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.
        6) Or equal.
        7)

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: 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 (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Boxes, enclosures, and cabinets.
4. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
2. Section 270528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal 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.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Allied Tube & Conduit.
2. Thomas & Betts Corporation.
3. Western Tube and Conduit Corporation.
4. Wheatland Tube Company.
5. Or equal.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. FMC: Comply with UL 1; aluminum.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

   a. Material: die cast.
   b. Type: compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. CANTEX Inc.
2. Condux International, Inc.
3. Lamson & Sessions; Carlon Electrical Products.
4. RACO; Hubbell.
5. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. LFNC: Comply with UL 1660.

F. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

G. Fittings for LFNC: Comply with UL 514B.

H. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

I. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hoffman.
2. Hubbell Incorporated.
3. Milbank Manufacturing Co.
4. RACO; Hubbell.
5. Spring City Electrical Manufacturing Company.
6. Thomas & Betts Corporation.
7. Or equal

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

K. Gangable boxes are prohibited.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Armorcast Products Company.
   b. Carson Industries LLC.
   c. Oldcastle Precast, Inc.
   d. Quazite: Hubbell Power System, Inc.
   e. Or equal.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC" “COMM”.
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: EMT.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 3R in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, cast-metal fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm)of enclosures to which attached.

I. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

U. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.

W. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

X. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Y. Locate boxes so that cover or plate will not span different building finishes.

Z. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

AA. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

BB. Set metal floor boxes level and flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 31.
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31.
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 260543

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.
2. Handholes and boxes.

1.3 DEFINITIONS

A. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including separators and miscellaneous components.
2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for manholes, handholes, boxes.
4. Include warning tape.

B. Shop Drawings:

1. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
b. Include duct entry provisions, including locations and duct sizes.
c. Include cover design.
d. Include grounding details.
e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

A. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
2. Drawings shall be signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C 858.

C. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

D. Source quality-control reports.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.7 FIELD CONDITIONS

A. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

A. Comply with ANSI C2.

2.2 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. CANTEX INC.
2. Condux International, Inc.
3. Electri-Flex Company.
4. Or equal.

B. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.

C. Solvents and Adhesives: As recommended by conduit manufacturer.

D. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

A. <Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Christy Concrete Products.
2. Oldcastle Precast, Inc.
3. Utility Concrete Products, LLC.
4. Utility Vault Co.
5. Wausau Tile Inc.
6. Or equal.

B. Comply with ASTM C 858 for design and manufacturing processes.

2.5 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect and Resident Engineer if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect and Resident Engineer.

C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Division 31. Remove and stockpile topsoil for reapplication according to Division 31.

3.2 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

B. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:

1. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
2. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
3. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Division 31, but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.

D. Cut and patch existing pavement in the path of underground ducts and utility structures according Division 01.

3.5 DUCT INSTALLATION

A. Install ducts according to NEMA TCB 2.

B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.

C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1200 mm), both horizontally and vertically, at other locations unless otherwise indicated.

D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

G. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in empty ducts.

H. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank. Comply with requirements in Division 31 for preparation of trench bottoms for pipes less than 6 inches (150 mm) in nominal diameter.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches (150 mm) between tiers.
4. Depth: Install top of duct bank at least 36 inches (900 mm) below finished grade unless otherwise indicated.
5. Install ducts with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and signal ducts.
6. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
7. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

8. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches (100 mm) over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Division 31 for installation of backfill materials.

   a. Place minimum 3 inches (75 mm) of sand as a bed for duct bank. Place sand to a minimum of 6 inches (150 mm) above top level of duct bank.

I. Warning Tape: Bury warning tape approximately 12 inches (300 mm) above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
2. Where indicated, cast handhole cover frame integrally with handhole structure.

3.7 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch- (150-mm-) long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.

3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.9 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification for conductors.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Equipment identification labels.
6. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage.

C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

2.2 CONDUCTOR IDENTIFICATION MATERIALS

A. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- (0.08-mm-) thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,.

C. Tag: Type ID:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils (0.125 mm).
3. Foil Core Thickness: 0.35 mil (0.00889 mm).
4. Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
5. 3-Inch (75-mm) Tensile According to ASTM D 882: 70 lbf (311.3 N), and 4600 psi (31.7 MPa).

2.4 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Cables within Buildings: Identify the inside and outside covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

C. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.

D. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes with the conductor designation.

E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

F. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.

4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Switchboards.
    d. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    e. Emergency system boxes and enclosures.
    f. Enclosed switches.
    g. Enclosed circuit breakers.
    h. Enclosed controllers.
    i. Power transfer equipment.
    j. Contactors.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Indoor occupancy sensors.
4. Lighting contactors.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.
2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Leviton Manufacturing Co., Inc.
4. NSi Industries LLC; TORK Products.
5. Or equal

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 30-A inductive or resistive, 240-V ac.
4. Programs: Eight on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
6. Astronomic Time: All channels.
7. Automatic daylight savings time changeover.
8. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. NSi Industries LLC; TORK Products.
4. Tyco Electronics; ALR Brand.
5. Or equal.

B. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
3. Time Delay: Fifteen second minimum, to prevent false operation.
4. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.3 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cooper Industries, Inc.
   2. Hubbell Building Automation, Inc.
   3. Leviton Manufacturing Co., Inc.
   4. Lithonia Lighting; Acuity Brands Lighting, Inc.
   5. Lutron Electronics Co., Inc.
   6. Sensor Switch, Inc.
   7. Watt Stopper.
   8. Or equal.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
   4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   5. Mounting:

      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
      c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

   6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
   7. Bypass Switch: Override the "on" function in case of sensor failure.
   8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.

C. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy .

   1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
   2. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

D. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Manufacturing Co., Inc.
4. Lithonia Lighting; Acuity Brands Lighting, Inc.
5. Lutron Electronics Co., Inc.
6. Sensor Switch, Inc.
7. Watt Stopper.
8. Or equal.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application, and shall comply with California Title 24.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor Tag WS2:

1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
2. Sensing Technology: PIR.
3. Switch Type: SP, manual "on," automatic "off."
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.

2.5 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP.
3. Eaton Corporation.
4. Square D.
5. Or equal.

B. Description: Electrically operated and mechanically held lighting contactors, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.

C. BAS Interface: Provide hardware interface to enable the BAS to monitor and control lighting contactors.

2.6 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller thanNo. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

END OF SECTION

SECTION 26 24 13

SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Disconnecting and overcurrent protective devices.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards 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."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Detail utility company's metering provisions with indication of approval by utility company.
7. Include evidence of NRTL listing for series rating of installed devices.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include diagram and details of proposed mimic bus.

10. Include schematic and wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Seismic Qualification Certificates: Submit certification that switchboards, overcurrent protective devices, accessories, and components will withstand seismic forces.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01, include the following:

1. Routine maintenance requirements for switchboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

C. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

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

F. Comply with NEMA PB 2.

G. Comply with NFPA 70.

H. Comply with UL 891.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards.

C. See "Testing and Inspecting" Article in the Evaluations for guidance on which option to select in paragraph below.

D. Handle and prepare switchboards for installation according to NEMA PB 2.1.

1.9 PROJECT CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

C. Service Conditions: NEMA PB 2, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.10 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or equal.

B. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

C. Nominal System Voltage: 208Y/120 V.

D. Main-Bus Continuous: 800 A.

E. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces.

F. Indoor Enclosures: Steel, NEMA 250, Type 1.

G. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

H. Barriers: Between adjacent switchboard sections.

I. Utility Metering Compartment: Fabricated, barrier compartment and section complying with utility company's requirements; hinged sealed door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

J. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

K. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, silver-plated, with copper feeder circuit-breaker line connections.
2. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
3. Ground Bus: Minimum-size required by UL 891, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
4. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Frame Size 200A and Greater: Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

   a. Adjustable instantaneous trip.
   b. Adjustable long- and short-time pickup levels.
   c. Adjustable Long- and short-time time adjustments.

2. Frame Size Less Than 200A: Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 150 A and larger.

3. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

   a. Standard frame sizes, trip ratings, and number of poles.
   b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NECA 400.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

C. Comply with mounting and anchoring requirements per manufacturer's recommendation.

D. Install filler plates in unused spaces of panel-mounted sections.

E. Install overcurrent protective devices.

1. Set field-adjustable switches and circuit-breaker trip ranges.

F. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

B. Switchboard will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Lighting and appliance branch-circuit panelboards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Panelboard Schedules: For installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01, include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

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. Keys: Two spares for each type of panelboard cabinet lock.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. 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 NEMA PB 1.

F. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.9 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.10 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.

B. Enclosures: Surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Finishes:

a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Same finish as panels and trim.

5. Directory Card: Inside panelboard door, mounted in transparent card holder.

C. Incoming Mains Location: Top.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Tin-plated aluminum.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 DISTRIBUTION PANELBOARDS

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or equal.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 ELECTRONIC-GRADE PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Current Technology; a subsidiary of Danahar Corporation.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
4. Liebert Corporation.
5. Siemens Energy & Automation, Inc.
6. Square D; a brand of Schneider Electric.
7. Or equal.

B. Panelboards: NEMA PB 1; with factory-installed, integral TVSS; labeled by an NRTL for compliance with UL 67 after installing TVSS.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

D. Main Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

E. Branch Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

F. Buses:

1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.
2. Copper equipment ground buses.

2.6 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or equal.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 150 A and larger.

2. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Comply with mounting and anchoring requirements per manufacturer's recommendation.

D. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

F. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

G. Install filler plates in unused spaces.

H. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

I. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

J. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.
3. Snap switches and wall-box dimmers.
4. Wall-switch and exterior occupancy sensors.
5. Communications outlets.
6. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).
5. Or equal.

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

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

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 5351 (single), CR5362 (duplex).
b. Hubbell; HBL5351 (single), HBL5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).
e. Or equal.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

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. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; 7590.
e. Or equal.

2.5 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.6 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Single Pole:

2) Cooper; AH1221.
3) Hubbell; HBL1221.
4) Leviton; 1221-2.
5) Pass & Seymour; CSB20AC1.
6) Or equal.

7) Two Pole:

8) Cooper; AH1222.
9) Hubbell; HBL1222.
10) Leviton; 1222-2.
11) Pass & Seymour; CSB20AC2.
12) Or equal.

13) Three Way:

14) Cooper; AH1223.
15) Hubbell; HBL1223.
16) Leviton; 1223-2.
17) Pass & Seymour; CSB20AC3.
18) Or equal.

2.7 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.8 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, solid brass with satin finish.

D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for UTP cable complying with requirements in Section 271500 "Communications Horizontal Cabling."

2.9 POKE-THROUGH ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Pass & Seymour/Legrand.
3. Square D/Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold/Legrand.
6. Or equal.

B. Description:

1. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
2. Comply with UL 514 scrub water exclusion requirements.
3. Service-Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks complying with requirements in Section 271500 "Communications Horizontal Cabling."
4. Size: Selected to fit nominal 4-inch (100-mm) cored holes in floor and matched to floor thickness.
5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
6. Closure Plug: Arranged to close unused 4-inch (100-mm) cored openings and reestablish fire rating of floor.
7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables that comply with requirements in Section 271500 "Communications Horizontal Cabling."

2.10 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: White or as selected by Architect and Resident Engineer unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. TVSS Devices: Blue.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets to suit arrangement of furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in enclosed switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Coordination charts and tables and related data.
5. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01, include the following:

1. Ambient temperature adjustment information.
2. Coordination charts and tables and related data.

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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

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

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.8 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.
5. Or equal.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:
   1. Motor Branch Circuits: Class RK5, time delay.
   2. Other Branch Circuits: Class RK1, time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the 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 enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01, include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

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 NFPA 70.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

1.11 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or equal.

B. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Mechanical type, suitable for number, size, and conductor material.

D. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 26 05 29 “Hangers and Supports for Electrical Systems.”

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 26 32 13

ENGINE GENERATORS

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 packaged engine-generator sets for emergency power supply with the following features:

1. Diesel engine.
2. Unit-mounted cooling system.
3. Unit-mounted control and monitoring.
4. Performance requirements for sensitive loads.
5. Outdoor enclosure.

B. Related Sections include the following:

1. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

B. LP: Liquid petroleum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:

1. Thermal damage curve for generator.
2. Time-current characteristic curves for generator protective device.

B. 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. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
4. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that engine-generator set, batteries, battery racks, accessories, and components will withstand seismic forces.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Qualification Data: For installer.

C. Source quality-control test reports.

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance with applicable regulations.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

D. Field quality-control test reports.

E. Warranty: Manufacturer’s standard warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01, include the following:

1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles (321 km) of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. 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), 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.

D. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

E. 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.

F. Comply with ASME B15.1.

G. Comply with NFPA 37.

H. Comply with NFPA 70.

I. Comply with NFPA 110 requirements for Level 1 emergency power supply system.

J. Comply with UL 2200.

K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

L. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 5 to 40 deg C.
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to 1000 feet (300 m).

1.10 COORDINATION

A. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

1.12 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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:

1. Caterpillar; Engine Div.
2. Generac Power Systems, Inc.
3. Kohler Co.
4. Onan/Cummins Power Generation; Industrial Business Group.
5. Or equal.

2.2 ENGINE-GENERATOR SET

A. Factory-assembled and -tested, engine-generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

C. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated.
2. Output Connections: Three-phase, four wire.
3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

D. Generator-Set Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.

8. Start Time: Comply with NFPA 110, Type 10, system requirements.

E. Generator-Set Performance for Sensitive Loads:

1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.

   a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.

2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.

   a. Provide permanent magnet excitation for power source to voltage regulator.

10. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.3 ENGINE

A. Fuel: Fuel oil, Grade DF-2.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m/s).

D. Lubrication System: The following items are mounted on engine or skid:

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.

3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Engine Fuel System:

1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
3. Dual Natural Gas with LP-Gas Backup (Vapor-Withdrawal) System:

    a. Carburetor.
    b. Secondary Gas Regulators: One for each fuel type.
    c. Fuel-Shutoff Solenoid Valves: One for each fuel source.
    d. Flexible Fuel Connectors: One for each fuel source.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

G. Governor: Mechanical.

H. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

    a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
    b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

I. Cooling System: Closed loop, liquid cooled, with remote radiator and integral engine-driven coolant pump.

1. Configuration: Vertical air discharge.
2. Radiator Core Tubes: Nonferrous-metal construction other than aluminum.
3. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
5. Fan: Driven by totally enclosed electric motor with sealed bearings.

6. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
7. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

J. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

1. Minimum sound attenuation of 25 dB at 500 Hz.
2. Sound level measured at a distance of 10 feet (3 m) from exhaust discharge after installation is complete shall be 85 dBA or less.

K. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

L. Starting System: 24-V electric, with negative ground.

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least twice without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.4 FUEL OIL STORAGE

A. Comply with NFPA 30.

B. Day Tank: Comply with UL 142, freestanding, factory-fabricated fuel tank assembly, with integral, float-controlled transfer pump and the following features:

1. Containment: Integral rupture basin with a capacity of 150 percent of nominal capacity of day tank.

a. Leak Detector: Locate in rupture basin and connect to provide audible and visual alarm in the event of day-tank leak.

2. Tank Capacity: As recommended by engine manufacturer for an uninterrupted period of 8 hours' operation at 100 percent of rated power output of engine-generator system without being refilled.
3. Pump Capacity: Exceeds maximum flow of fuel drawn by engine-mounted fuel supply pump at 110 percent of rated capacity, including fuel returned from engine.
4. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.
5. High-Level Alarm Sensor: Liquid-level device operates alarm and redundant fuel shutoff contacts at midpoint between overflow level and 100 percent of normal fuel level.
6. Piping Connections: Factory-installed fuel supply and return lines from tank to engine; local fuel fill, vent line, overflow line; and tank drain line with shutoff valve.
7. Redundant High-Level Fuel Shutoff: Actuated by high-level alarm sensor in day tank to operate a separate motor device that disconnects day-tank pump motor. Sensor shall signal solenoid valve, located in fuel suction line between fuel storage tank and day tank, to close. Both actions shall remain in shutoff state until manually reset. Shutoff action shall initiate an alarm signal to control panel but shall not shut down engine-generator set.

C. Base-Mounted Fuel Oil Tank: Factory installed and piped, complying with UL 142 fuel oil tank. Features include the following:

1. Tank level indicator.
2. Capacity: Fuel for eight hours' continuous operation at 100 percent rated power output.
3. Vandal-resistant fill cap.
4. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.5 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.

D. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Fuel tank derangement alarm.
11. Fuel tank high-level shutdown of fuel supply alarm.
12. Generator overload.

E. Indicating and Protective Devices and Controls:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Start-stop switch.
11. Overspeed shutdown device.
12. Coolant high-temperature shutdown device.
13. Coolant low-level shutdown device.
14. Oil low-pressure shutdown device.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Generator overload.

F. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

G. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals. Consult with manufacturer for data system connections to terminals.

H. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.

1. Overcrank shutdown.
2. Coolant low-temperature alarm.
3. Control switch not in auto position.
4. Battery-charger malfunction alarm.
5. Battery low-voltage alarm.

I. Common Remote Audible Alarm: Signal the occurrence of any events listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.

1. Engine high-temperature shutdown.
2. Lube-oil, low-pressure shutdown.
3. Overspeed shutdown.
4. Remote emergency-stop shutdown.
5. Engine high-temperature prealarm.
6. Lube-oil, low-pressure prealarm.
7. Fuel tank, low-fuel level.
8. Low coolant level.

J. Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

K. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.6 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 100 percent rated; complying with NEMA AB 1 and UL 489.

1. Tripping Characteristic: Designed specifically for generator protection.
2. Trip Rating: Matched to generator rating.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

B. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector shall perform the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

C. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Enclosure: Dripproof.

G. Instrument Transformers: Mounted within generator enclosure.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.

I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

K. Subtransient Reactance: 12 percent, maximum.

2.8 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Vandal-resistant, weatherproof steel housing, wind resistant up to 100 mph (160 km/h). Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

2.9 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Isolation.
    h. Vibration Mountings & Controls, Inc.
    i. Or equal.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties.
5. Surface Pattern: Smooth pattern.
6. Infused nonwoven cotton or synthetic fibers.
7. Load-bearing metal plates adhered to pads.
8. Sandwich-Core Material: Resilient and elastomeric.

    a. Surface Pattern: Smooth pattern.
    b. Infused nonwoven cotton or synthetic fibers.

B. Restrained Spring Isolators: Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing: Insert drawing designation.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Isolation.
    h. Vibration Mountings & Controls, Inc.
    i. Or equal.

2. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.

    a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig (3447 kPa).
    b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.10 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.11 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Full load run.
3. Maximum power.
4. Voltage regulation.
5. Transient and steady-state governing.
6. Single-step load pickup.
7. Safety shutdown.
8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
9. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

C. Install packaged engine generator on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Division 03 "Cast-in-Place Concrete."

1. Comply with requirements for seismic control devices.
2. Comply with requirements for vibration isolation devices specified in this section.

D. Install remote radiator with elastomeric isolator pads having a minimum deflection of 1 inch (25 mm) on concrete base on grade.

E. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect engine exhaust pipe to engine with flexible connector.

C. Connect fuel piping to engines with a gate valve and union and flexible connector.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 IDENTIFICATION

A. Identify system components according to Division 23 and Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection (except those indicated to be optional) for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
    a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    c. Verify acceptance of charge for each element of the battery after discharge.
    d. Verify that measurements are within manufacturer's specifications.
4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg (120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
7. Exhaust Emissions Test: Comply with applicable government test criteria.
8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
9. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.
10. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations on the property line, and compare measured levels with required values.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 DEMONSTRATION

1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 01.

END OF SECTION

SECTION 26 36 00

TRANSFER SWITCHES

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 transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

B. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01, include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. 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.

C. Source Limitations: Obtain automatic transfer switches through one source from a single manufacturer.

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

E. Comply with NEMA ICS 1.

F. Comply with NFPA 70.

G. Comply with NFPA 110.

H. Comply with UL 1008 unless requirements of these Specifications are stricter.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Contactor Transfer Switches:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Caterpillar; Engine Div.
   b. Emerson; ASCO Power Technologies, LP.
   c. Generac Power Systems, Inc.
   d. GE Zenith Controls.
   e. Kohler Power Systems; Generator Division.

f. Onan/Cummins Power Generation; Industrial Business Group.
g. Russelectric, Inc.
h. Or equal.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

I. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

J. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.

K. Battery Charger: For generator starting batteries.

1. Float type rated 10 A.
2. Ammeter to display charging current.
3. Fused ac inputs and dc outputs.

L. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

M. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

N. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

G. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.

H. Automatic Closed-Transition Transfer Switches: Include the following functions and characteristics:

1. Fully automatic make-before-break operation.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.

    a. Initiation occurs without active control of generator.
    b. Controls ensure that closed-transition load transfer closure occurs only when the 2 sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.

4. Failure of power source serving load initiates automatic break-before-make transfer.

I. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

J. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

K. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Pause is adjustable from 0.5 to 30 seconds minimum and factory set for 0.5 second, unless otherwise indicated. Time delay occurs for both transfer directions. Pause is disabled unless both sources are live.

L. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.

11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details.

B. Identify components according to Section 260553 "Identification for Electrical Systems."

C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

B. Testing Agency's Tests and Inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

F. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below. Refer to Division 01.

B. Coordinate this training with that for generator equipment.

END OF SECTION

SECTION 27 05 26

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding rods.
5. Grounding labeling.

1.3 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.

B. EMT: Electrical metallic tubing.

C. TGB: Telecommunications grounding busbar.

D. TMGB: Telecommunications main grounding busbar.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications equipment room signal reference grid. Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing as-built locations of grounding and bonding infrastructure, including the following:

1. Ground rods.
2. Ground and roof rings.
3. BCT, TMGB, TGBs, and routing of their bonding conductors.

B. Qualification Data: For Installer, installation supervisor, and field inspector.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 01, include the following:

a. Result of the ground-resistance test, measured at the point of BCT connection.
b. Result of the bonding-resistance test at each TGB and its nearest grounding electrode.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Installation Supervision: Installation shall be under the direct supervision of ITS Technician, who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a registered communications distribution designer to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 SYSTEM COMPONENTS

A. Comply with J-STD-607-A.

2.2 CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Harger Lightning and Grounding.
2. Panduit Corp.
3. Tyco Electronics Corp.
4. Or equal.

B. Comply with UL 486A-486B.

C. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.

1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
2. Cable Tray Equipment Grounding Wire: No. 8 AWG.

D. Cable Tray Grounding Jumper:
1. Not smaller than No. 10 AWG and not longer than 12 inches (300 mm). If jumper is a wire, it shall have a crimped grounding lug with one hole and standard barrel for one crimp. If jumper is a flexible braid, it shall have a one- or two-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.

E. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Bonding Cable: 28 kcmils (14.2 sq. mm), 14 strands of No. 17 AWG conductor, and 1/4 inch (6.3 mm) in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.3 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Chatsworth Products, Inc.
3. Harger Lightning and Grounding.
4. Panduit Corp.
5. Tyco Electronics Corp.
6. Or equal.

C. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.

1. Electroplated tinned copper, C and H shaped.

D. Busbar Connectors: Cast silicon bronze, solderless exothermic-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two-bolt connection to the busbar.

E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Chatsworth Products, Inc.
2. Harger Lightning and Grounding.
3. Panduit Corp.
4. Or equal.

B. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with J-STD-607-A.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide a 4-inch ((100-mm)) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

C. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches (6.3 by 50 mm) in cross section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with J-STD-607-A.

1. Predrilling shall be with holes for use with lugs specified in this Section.
2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch ((50-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.)
3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

D. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with J-STD-607-A. Predrilling shall be with holes for use with lugs specified in this Section.

1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch (483- or 584-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
3. Rack-Mounted Vertical Busbar: 72 or 36 inches ((1827 or 914 mm) long, with)stainless-steel or copper-plated hardware for attachment to the rack.

2.5 GROUND RODS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Harger Lightning and Grounding.
2. Tyco Electronics Corp.
3. Or equal.

B. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

2.6 LABELING

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brother International Corporation.
2. HellermannTyton.
3. Panduit Corp.
4. Or equal.

B. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

B. Inspect the test results of the ac grounding system measured at the point of BCT connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with J-STD-607-A.

3.3 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. Underground Grounding Conductors: Install barecopper conductor, No. 2 AWG minimum.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

D. Conductor Support:

1. Secure grounding and bonding conductors at intervals of not less than 36 inches ((900 mm).)

E. Grounding and Bonding Conductors:

1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch (900-mm) intervals.
4. Install grounding and bonding conductors in 3/4-inch (21-mm) PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

    a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 1/0 AWG.

3.5 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 12 inches (300 mm) above finished floor unless otherwise indicated.

B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.6 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:

1. Use crimping tool and the die specific to the connector.
2. Pretwist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot (1 sq. mm/linear meter) of conductor length, up to a maximum size of No. 3/0 AWG 168 kcmils (85 sq. mm) unless otherwise indicated.

F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Install vertically mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.

G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.

H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

I. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA/EIA-568-B.1 and TIA/EIA-568-B.2 when grounding screened, balanced, twisted-pair cables.

J. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

3.7 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

B. Comply with IEEE C2 grounding requirements.

C. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) extends above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

3.8 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.

1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier for the space containing the TMGB.
2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.

    a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.

3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.

    a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.

C. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect and Resident Engineer promptly and include recommendations to reduce ground resistance.

D. Grounding system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

SECTION 27 05 28

PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Boxes, enclosures, and cabinets.
5. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
2. Section 260533 "Raceways and Boxes for Electrical Systems" for conduits, wireways, surface raceways, boxes, enclosures, cabinets, handholes, and faceplate adapters serving electrical systems.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For pathway racks, enclosures, cabinets, equipment racks and their mounting provisions, including those for internal 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 certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit.
3. Alpha Wire Company.
4. Anamet Electrical, Inc.
5. Electri-Flex Company.
6. O-Z/Gedney.
7. Picoma Industries.
8. Republic Conduit.
9. Robroy Industries.
10. Southwire Company.
11. Thomas & Betts Corporation.
12. Western Tube and Conduit Corporation.
13. Wheatland Tube Company.
14. Or equal.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: die cast.
b. Type: compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

H. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit.
3. Anamet Electrical, Inc.
4. Arnco Corporation.
5. CANTEX Inc.
6. CertainTeed Corporation.
7. Condux International, Inc.
8. Electri-Flex Company.
9. Kraloy.
10. Lamson & Sessions; Carlon Electrical Products.
11. Niedax-Kleinhuis USA, Inc.
12. RACO; Hubbell.
13. Thomas & Betts Corporation.
14. Or equal.

B. General Requirements for Nonmetallic Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Rigid HDPE: Comply with UL 651A.

E. Continuous HDPE: Comply with UL 651B.

F. RTRC: Comply with UL 1684A and NEMA TC 14.

G. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

H. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

I. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpha Wire Company.
2. Arnco Corporation.
3. Endot Industries Inc.
4. IPEX.
5. Lamson & Sessions; Carlon Electrical Products.
6. Or equal.

B. Description: Comply with UL 2024; flexible-type pathway, approved for plenum installation unless otherwise indicated.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Technologies Company; Cooper Crouse-Hinds.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Mono-Systems, Inc.
6. O-Z/Gedney.
7. Thomas & Betts Corporation.

8. Wiremold / Legrand.
9. Or equal.

B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-B.
2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

F. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

J. Gangable boxes are prohibited.

K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures:

a. Material: Plastic.
b. Finished inside with radio-frequency-resistant paint.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

L. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND CABLING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Comply with TIA-569-B.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Armorcast Products Company.
   b. Carson Industries LLC.
   c. NewBasis.
   d. Oldcastle Precast, Inc; Christy Concrete Products.
   e. Quazite: Hubbell Power System, Inc; Hubbell Power Systems.
   f. Synertech Moulded Products.
   g. Or equal.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "COMMUNICATIONS.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long) and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: EMT.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Damp or Wet Locations: GRC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: EMT.
7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: EMT.
8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: EMT.
9. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 3/4-inch (21-mm) trade size. Minimum size for optical-fiber cables is 1 inch (27 mm).

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, cast-metal fittings. Comply with NEMA FB 2.10.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface pathways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Complete pathway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches (300 mm) of changes in direction. Utilize long radius ells for all optical-fiber cables.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm) of enclosures to which attached.

I. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.
3. Arrange pathways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect and Resident Engineer for each specific location.
5. Change from ENT to RNC, Type EPC-40-PVC, before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

N. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits of 2-inch (53-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

Q. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg)tensile strength. Leave at least 12 inches (300 mm)of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.

R. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch (21-mm) Trade Size and Smaller: Install pathways in maximum lengths of 50 feet (15 m).
2. 1-Inch (27-mm) Trade Size and Larger: Install pathways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

S. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.

T. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

V. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F (55 deg C) and that has straight-run length that exceeds 100 feet (30 m).
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Z. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

AA. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

BB. Set metal floor boxes level and flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 31.
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31.
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, but a minimum of 6 inches (150 mm) below grade. Align planks along centerline of conduit.
7. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.

E. Field cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 27 05 36

CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ladder cable trays.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.

1. Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

C. Delegated-Design Submittal: For seismic restraints.

1. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer, licensed in the state where Project is located, who is responsible for their preparation.
2. Design Calculations: Calculate requirements for selecting seismic restraints.
3. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Include scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.
2. Vertical and horizontal offsets and transitions.
3. Clearances for access above and to side of cable trays.
4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.

B. Seismic Qualification Certificates: For cable trays, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01, to design cable tray supports and seismic bracing.

B. Seismic Performance: Cable trays and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the cable trays will remain in place without separation of any parts when subjected to the seismic forces specified."
2. Component Importance Factor: 1.5.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes in cable tray installed outdoors.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.3 LADDER CABLE TRAYS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Allied Tube & Conduit; a Tyco International Ltd. Co.
2. Chalfant Manufacturing Company.
3. Cooper B-Line, Inc.
4. Mono-Systems, Inc.
5. Or equal.

B. Description:

1. Configuration: Two I-beam side rails with transverse rungs welded to side rails.
2. Rung Spacing: 12 inches (300 mm) o.c.
3. Radius-Fitting Rung Spacing: 9 inches (225 mm) at center of tray's width.
4. Minimum Cable-Bearing Surface for Rungs: 7/8-inch (22-mm) width with radius edges.
5. No portion of the rungs shall protrude below the bottom plane of side rails.
6. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb (90-kg) concentrated load, when tested according to NEMA VE 1.
7. Minimum Usable Load Depth: 4 inches (100 mm).
8. Straight Section Lengths: 10 feet (3 m) except where shorter lengths are required to facilitate tray assembly.
9. Width: 12 inches (300 mm) unless otherwise indicated on Drawings.
10. Fitting Minimum Radius: 12 inches (300 mm).
11. Class Designation: Comply with NEMA VE 1, Class 12B.
12. Splicing Assemblies: Bolted type using serrated flange locknuts.
13. Hardware and Fasteners: ASTM F 593 and ASTM F 594 stainless steel, Type 316.
14. Splice Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

2.4 MATERIALS AND FINISHES

A. Steel:

1. Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of ASTM A 1011/A 1011M, SS, Grade 33.
2. Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.
3. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.
4. Finish: Mill galvanized before fabrication.
    a. Standard: Comply with ASTM A 653/A 653M, G90 (Z275).
    b. Hardware: Galvanized, ASTM B 633.
5. Finish: Electrogalvanized before fabrication.
    a. Standard: Comply with ASTM B 633.
    b. Hardware: Galvanized, ASTM B 633.
6. Finish: Hot-dip galvanized after fabrication.
    a. Standard: Comply with ASTM A 123/A 123M, Class B2.

b. Hardware: Chromium-zinc plated, ASTM F 1136.

7. Finish: Epoxy-resin paint.

a. Powder-Coat Enamel: Cable tray manufacturer's recommended primer and corrosion-inhibiting treatment, with factory-applied powder-coat paint.
b. Epoxy-Resin Prime Coat: Cold-curing epoxy primer, MPI# 101.
c. Epoxy-Resin Topcoat: Epoxy, cold-cured, gloss, MPI# 77.
d. Hardware: Chromium-zinc plated, ASTM F 1136.

8. Finish: Factory-standard primer, ready for field painting, with chromium-zinc-plated hardware according to ASTM F 1136.
9. Finish: Black oxide finish for support accessories and miscellaneous hardware according to ASTM D 769.

B. Aluminum:

1. Materials: Alloy 6063-T6 according to ANSI H 35.1/H 35.1M for extruded components and Alloy 5052-H32 according to ANSI H 35.1/H 35.1M for fabricated parts.
2. Hardware: Chromium-zinc-plated steel, ASTM F 1136.
3. Hardware for Aluminum Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

2.5 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Covers: Louvered type made of same materials and with same finishes as cable tray.

C. Barrier Strips: Same materials and finishes as for cable tray.

D. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.6 WARNING SIGNS

A. Lettering: 1-1/2-inch- (40-mm-) high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel."

B. Comply with requirements for fasteners in Section 260553 "Identification for Electrical Systems."

2.7 SOURCE QUALITY CONTROL

A. Testing: Test and inspect cable trays according to NEMA FG 1.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Install cable trays according to NEMA FG 1.

B. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

D. Remove burrs and sharp edges from cable trays.

E. Join aluminum cable tray with splice plates; use four square neck-carriage bolts and locknuts.

F. Fasten cable tray supports to building structure and install seismic restraints.

G. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb (90 kg). Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems." Comply with seismic-restraint details according to Section 260548.16 "Seismic Controls for Electrical Systems."

H. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

I. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

J. Support bus assembly to prevent twisting from eccentric loading.

K. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

L. Locate and install supports according to NEMA FG 1. Do not install more than one cable tray splice between supports.

M. Support trapeze hangers for wire-basket trays with 1/4-inch- (6-mm-) diameter rods.

N. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

O. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA FG 1. Space connectors and set gaps according to applicable standard.

P. Make changes in direction and elevation using manufacturer's recommended fittings.

Q. Make cable tray connections using manufacturer's recommended fittings.

R. Seal penetrations through fire and smoke barriers. Comply with requirements in Division 07.

S. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

T. Install cable trays with enough workspace to permit access for installing cables.

U. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

V. Install permanent covers, if used, after installing cable. Install cover clamps according to NEMA VE 2.

W. Clamp covers on cable trays installed outdoors with heavy-duty clamps.

X. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.2 CABLE TRAY GROUNDING

A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Cable trays with communications cable shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Cable trays with control conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

D. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.

E. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.3 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. Fasten cables on vertical runs to cable trays every 18 inches (450 mm).

D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches (1800 mm).

E. Tie MI cables down every 36 inches (900 mm) where required to provide a 2-hour fire rating and every 72 inches (1800 mm) elsewhere.

F. In existing construction, remove inactive or dead cables from cable trays.

3.4 CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION

SECTION 27 15 00

COMMUNICATIONS HORIZONTAL CABLING

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. UTP cabling.
2. 62.5/125-micrometer, optical fiber cabling.
3. Coaxial cable.
4. Multiuser telecommunications outlet assemblies.
5. Cable connecting hardware, patch panels, and cross-connects.
6. Telecommunications outlet/connectors.
7. Cabling system identification products.
8. Cable management system.

B. Related Requirements:
1. Section 28 05 13 "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

D. EMI: Electromagnetic interference.

E. IDC: Insulation displacement connector.

F. LAN: Local area network.

G. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.

H. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

I. RCDD: Registered Communications Distribution Designer.

J. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For coaxial cable, include the following installation data for each type used:

    a. Nominal OD.
    b. Minimum bending radius.
    c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:

    a. Cross-connects.
    b. Patch panels.
    c. Patch cords.

5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For splices and connectors to include in maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type.
2. Connecting Blocks: One of each type.
3. Device Plates: One of each type.
4. Multiuser Telecommunications Outlet Assemblies: One of each type.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cables to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.
2. Test optical fiber cables while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; including the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.
4. Splitters shall not be installed as part of the optical fiber cabling.

B. A work area is approximately 100 sq. ft. (9.3 sq. m), and includes the components that extend from the telecommunications outlet/connectors to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

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

D. Grounding: Comply with J-STD-607-A.

2.3 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements in Division 06 for plywood backing panels.

2.4 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Belden Inc.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.

4. Superior Essex Inc.
5. SYSTIMAX Solutions; a CommScope, Inc. brand.
6. 3M Communication Markets Division.
7. Tyco Electronics Corporation; AMP Products.
8. Or equal.

B. Description: 100-ohm, four-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

   a. Communications, General Purpose: Type CM or CMG.
   b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
   c. Communications, Riser Rated: Type CMR, complying with UL 1666.

2.5 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Belden Inc.
2. Dynacom Inc.
3. Leviton Commercial Networks Division.
4. Molex Premise Networks; a division of Molex, Inc.
5. Panduit Corp.
6. Siemon Co. (The).
7. Tyco Electronics Corporation; AMP Products.
8. Or equal.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.

F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

G. Patch Cords: Factory-made, four-pair cables in 36-inch (900 mm) lengths; terminated with eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

2.6 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden Inc.
2. Berk-Tek; a Nexans company.
3. Mohawk; a division of Belden Networking, Inc.
4. Superior Essex Inc.
5. SYSTIMAX Solutions; a CommScope, Inc. brand.
6. 3M Communication Markets Division.
7. Tyco Electronics Corporation; AMP Products.
8. Or equal.

B. Description: Multimode, 62.5/125-micrometer, 24-fiber,tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with TIA-492AAAB for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
   a. General Purpose, Conductive: Type OFC or OFCG.
   b. Plenum Rated, Conductive: Type OFCP, complying with NFPA 262.
5. Conductive cable shall be aluminum armored type.
6. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
7. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color: Orange for 62.5/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

2.7 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Belden Inc.
2. Berk-Tek; a Nexans company.
3. Dynacom Inc.
4. Hubbell Premise Wiring.
5. Molex Premise Networks; a division of Molex, Inc.

6. Siemon Co. (The).
7. Or equal.

B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. Patch Cords: Factory-made, dual-fiber cables in 36-inch (900-mm) lengths.

D. Cable Connecting Hardware:

1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
2. Quick-connect, simplex and duplex, Type LC connectors. Insertion loss not more than 0.75 dB.
3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.8 COAXIAL CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpha Wire Company.
2. Belden Inc.
3. Coleman Cable, Inc.
4. CommScope, Inc.
5. Draka Cableteq USA.
6. Or equal.

B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

C. RG-11/U: NFPA 70, Type CATV.

1. No. 14 AWG, solid, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
4. Jacketed with sunlight-resistant, black PVC or PE.
5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

D. RG-6/U: NFPA 70, Type CATV or CM.

1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

E. RG59/U: NFPA 70, Type CATV.

1. No. 20 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum polyester tape and 40 percent aluminum braid.
3. PVC jacket.

F. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:

1. CATV Cable: Type CATV, or CATVP or CATVR.
2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.

2.9 COAXIAL CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Emerson Network Power Connectivity Solutions.
2. Leviton Commercial Networks Division.
3. Siemon Co. (The).
4. Or equal.

B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.10 CONSOLIDATION POINTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Hubbell Premise Wiring.
2. Molex Premise Networks; a division of Molex, Inc.
3. Ortronics, Inc.; a subsidiary of Legrand Group.
4. Panduit Corp.
5. Siemon Co. (The).
6. Or equal.

B. Description: Consolidation points shall comply with requirements for cable connecting hardware.

1. Number of Terminals per Field: One for each conductor in assigned cables.
2. Number of Connectors per Field:

    a. One for each four-pair UTP cable indicated.
    b. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.

3. Mounting: Recessed in ceiling.
4. NRTL listed as complying with UL 50 and UL 1863.
5. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2.11 MULTIUSER TELECOMMUNICATIONS OUTLET ASSEMBLY (MUTOA)

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden Inc.
2. Chatsworth Products, Inc.
3. Hubbell Premise Wiring.
4. Molex Premise Networks; a division of Molex, Inc.
5. Ortronics, Inc.; a subsidiary of Legrand Group.
6. Panduit Corp.
7. Siemon Co. (The).
8. Or equal.

B. Description: MUTOAs shall meet the requirements for cable connecting hardware.

1. Number of Terminals per Field: One for each conductor in assigned cables.
2. Number of Connectors per Field:

    a. One for each four-pair UTP cable indicated.
    b. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.

3. Mounting: Recessed in ceiling.
4. NRTL listed as complying with UL 50 and UL 1863.
5. Label shall include maximum length of work area cords, based on TIA/EIA-568-B.1.
6. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2.12 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate.

1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 26 27 26 "Wiring Devices."
2. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.

    a. Flush mounting jacks, positioning the cord at a 45-degree angle.
3. Legend: Machine printed, in the field, using adhesive-tape label.
4. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.13 GROUNDING

A. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with J-STD-607-A.

2.14 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

2.15 CABLE MANAGEMENT SYSTEM

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. iTRACS Corporation, Inc.
2. TelSoft Solutions.
3. Or equal.

B. Description: Computer-based cable management system, with integrated database and graphic capabilities.

C. Document physical characteristics by recording the network, TIA/EIA details, and connections between equipment and cable.

D. Information shall be presented in database view, schematic plans, or technical drawings.

1. AutoCAD drawing software shall be used as drawing and schematic plans software.

E. System shall interface with the following testing and recording devices:

1. Direct upload tests from circuit testing instrument into the personal computer.
2. Direct download circuit labeling into labeling printer.

2.16 SOURCE QUALITY CONTROL

A. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

B. Factory test UTP cables according to TIA/EIA-568-B.2.

C. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.

D. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

E. Cable will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal pathways and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements in Section 27 05 28 "Pathways for Communications Systems."
3. Comply with requirements in Section 27 05 36 "Cable Trays for Communications Systems."

B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
2. Install lacing bars and distribution spools.
3. Install conductors parallel with or at right angles to sides and back of enclosure.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. MUTOA shall not be used as a cross-connect point.
5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:

    a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
    b. Locate consolidation points for UTP at least 49 feet (15 m) from communications equipment room.

6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
11. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

D. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

E. Outdoor Coaxial Cable Installation:

1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches (915 mm).

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRESTOPPING

A. Comply with requirements in Division 07.

B. Comply with TIA-569-B, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

1. Administration Class: 1.
2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.

B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.

C. Comply with requirements in Division 09 for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

D. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration, including optional identification requirements of this standard.

E. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

F. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

G. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

H. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. Optical Fiber Cable Tests:

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
    b. Link End-to-End Attenuation Tests:

        1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-A, Method B, One Reference Jumper.
        2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

6. UTP Performance Tests:

    a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

        1) Wire map.
        2) Length (physical vs. electrical, and length requirements).
        3) Insertion loss.
        4) Near-end crosstalk (NEXT) loss.
        5) Power sum near-end crosstalk (PSNEXT) loss.
        6) Equal-level far-end crosstalk (ELFEXT).
        7) Power sum equal-level far-end crosstalk (PSELFEXT).
        8) Return loss.
        9) Propagation delay.
        10) Delay skew.

7. Optical Fiber Cable Performance Tests: Perform optical fiber end-to-end link tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.3.
8. Coaxial Cable Tests: Conduct tests according to manufacturer's recommendation.
9. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.

    a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
    b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

END OF SECTION

SECTION 280513

CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

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. Fire alarm wire and cable.
   2. Identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

   1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site. Test each pair of UTP cable for open and short circuits.

1.7 FIELD CONDITIONS

A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.

   1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.

B. Environmental Limitations: Do not deliver or install UTP cable and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

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

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."

2.3 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Comtran Corporation.
2. Draka Cableteq USA.
3. Genesis Cable Products; Honeywell International, Inc.
4. Rockbestos-Suprenant Cable Corp.
5. West Penn Wire.
6. Or equal.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

2.4 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady Worldwide, Inc.
2. HellermannTyton North America.
3. Kroy LLC.
4. Panduit Corp.
5. Or equal.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Cable will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for installation of supports for cables.

3.2 WIRING METHOD

A. Install wiring in metal pathways and wireways.

1. Minimum conduit size shall be 3/4 inch (21 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.

B. Install cable, concealed in accessible ceilings, walls, and floors when possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
2. Install lacing bars and distribution spools.

3. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.
4. Install conductors parallel with or at right angles to sides and back of enclosure.
5. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks.
6. Mark each terminal according to system's wiring diagrams.
7. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

C. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

D. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (600 mm).

3. Separation between cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

4. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
5. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal raceway according to Section 260533 "Raceways and Boxes for Electrical Systems."

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring Method:

1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of 2-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is permitted.
3. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

H. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.5 POWER AND CONTROL-CIRCUIT CONDUCTORS

A. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.

B. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.6 CONNECTIONS

A. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System for connecting, terminating, and identifying wires and cables.

3.7 FIRESTOPPING

A. Comply with requirements in Division 07 "Penetration Firestopping."

B. Comply with TIA-569-B, "Firestopping" Annex A.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.8 GROUNDING

A. For communications wiring, comply with J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 28 31 11

DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

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. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Air-sampling smoke detectors.
5. Heat detectors.
6. Notification appliances.
7. Firefighters' two-way telephone communication service.
8. Firefighters' smoke-control station.
9. Remote annunciator.
10. Digital alarm communicator transmitter.
11. Network communications.
12. System printer.

B. Related Requirements:

1. Section 280513 "Conductors and Cables for Electronic Safety and Security" for cables and conductors for fire-alarm systems.

1.3 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. HLI: High Level Interface.

D. NICET: National Institute for Certification in Engineering Technologies.

E. PC: Personal computer.

F. VESDA: Very Early Smoke-Detection Apparatus.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.

1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Provide program report showing that air-sampling detector pipe layout balances pneumatically within the airflow range of the air-sampling detector.
12. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.

    a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    b. Show field wiring required for HVAC unit shutdown on alarm.
    c. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' control system.
    d. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' smoke-evacuation system.
    e. Locate detectors according to manufacturer's written recommendations.
    f. Show air-sampling detector pipe routing.

13. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
14. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect and Resident Engineer.
2. Shop Drawings shall be prepared by persons with the following qualifications:

    a. Trained and certified by manufacturer in fire-alarm system design.
    b. NICET-certified, fire-alarm technician; Level IV minimum.
    c. Licensed or certified by authorities having jurisdiction.

D. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1.6 Sample Warranty: For manufacturer’s standard warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Division 01, include the following and deliver copies to authorities having jurisdiction:

a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
d. Riser diagram.
e. Device addresses.
f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
g. Record copy of site-specific software.

h. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

i. Manufacturer's required maintenance related to system warranty requirements.
j. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
5. Keys and Tools: One extra set for access to locked or tamperproofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level IV technician.

C. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

D. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

E. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FM Global-approved alarm company.

1.10 PROJECT CONDITIONS

A. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as designed.

B. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.11 WARRANTY

A. Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

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

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm and specific initiating device at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.

5. Release fire and smoke doors held open by magnetic door holders.
6. Activate voice/alarm communication system.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Activate smoke-control system (smoke management) at firefighters' smoke-control system panel.
9. Close smoke dampers in air ducts of designated air-conditioning duct systems.
10. Activate preaction system.
11. Recall elevators to primary or alternate recall floors.
12. Activate elevator power shunt trip.
13. Activate emergency lighting control.
14. Activate emergency shutoffs for gas and fuel supplies.
15. Record events in the system memory.
16. Record events by the system printer.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Elevator shunt-trip supervision.
3. Fire pump running.
4. Fire-pump loss of power.
5. Fire-pump power phase reversal.
6. User disabling of zones or individual devices.
7. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways 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 and the unit will be fully operational after the seismic event."

2.4 FIRE-ALARM CONTROL UNIT

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Fire-Lite Alarms.
2. GAMEWELL.
3. Notifier.
4. Siemens Industry, Inc.; Fire Safety Division.
5. Silent Knight.
6. SimplexGrinnell LP.
7. Or equal.

B. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.

a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.
c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
d. The FACP shall be listed for connection to a central-station signaling system service.
e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.

2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, two line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1. Pathway Class Designations: NFPA 72, Class B.
2. Pathway Survivability: Level 1.
3. Install no more than 50 addressable devices on each signaling-line circuit.
4. Serial Interfaces:

    a. One dedicated RS 485 port for central-station operation using point ID DACT.
    b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
    c. One USB port for PC configuration.
    d. One RS 232 port for VESDA HLI connection.
    e. One RS 232 port for voice evacuation interface.

E. Stairwell and Elevator Shaft Pressurization: Provide an output signal using an addressable relay to start the stairwell and elevator shaft pressurization system. Signal shall remain on until alarm conditions are cleared and fire-alarm system is reset. Signal shall not stop in response to alarm acknowledge or signal silence commands.

1. Pressurization starts when any alarm is received at fire-alarm control unit.
2. Alarm signals from smoke detectors at pressurization air supplies have a higher priority than other alarm signals that start the system.

F. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

G. Notification-Appliance Circuit:

1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

H. Elevator Recall:

1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:

a. Elevator lobby detectors except the lobby detector on the designated floor.
b. Smoke detector in elevator machine room.
c. Smoke detectors in elevator hoistway.

2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

I. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall be connected to fire-alarm system.

J. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

K. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

L. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

M. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.5 PREACTION SYSTEM

A. Initiate Presignal Alarm: This function shall cause an audible and visual alarm and indication to be provided at the FACP. Activation of an initiation device connected as part of a preaction system shall be annunciated at the FACP only, without activation of the general evacuation alarm.

2.6 MANUAL FIRE-ALARM BOXES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Fire-Lite Alarms.
   2. GAMEWELL.
   3. Notifier.
   4. Siemens Industry, Inc.; Fire Safety Division.
   5. Silent Knight.
   6. SimplexGrinnell LP.
   7. Or equal.

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

   1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
   2. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
   3. Station Reset: Key- or wrench-operated switch.
   4. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
   5. Weatherproof Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.7 SYSTEM SMOKE DETECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Fire-Lite Alarms.
   2. GAMEWELL.
   3. Gentex Corporation.
   4. Notifier.
   5. Siemens Industry, Inc.; Fire Safety Division.
   6. Silent Knight.
   7. SimplexGrinnell LP.
   8. System Sensor.
   9. Or equal.

B. General Requirements for System Smoke Detectors:

   1. Comply with UL 268; operating at 24-V dc, nominal.
   2. Detectors shall be two-wire type.
   3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
   4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
   5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.

6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

C. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

D. Ionization Smoke Detector:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

E. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.8 HEAT DETECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Fire-Lite Alarms.
   2. GAMEWELL.
   3. Gentex Corporation.
   4. Notifier.
   5. Siemens Industry, Inc.; Fire Safety Division.
   6. Silent Knight.
   7. SimplexGrinnell LP.
   8. System Sensor.
   9. Or equal.

B. General Requirements for Heat Detectors: Comply with UL 521.

   1. Temperature sensors shall test for and communicate the sensitivity range of the device.

C. Heat Detector, Combination Type: Actuated by either a fixed temperature of Insert temperature or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.

   1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

D. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).

   1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.9 NOTIFICATION APPLIANCES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Gentex Corporation.
   2. Siemens Industry, Inc.; Fire Safety Division.
   3. SimplexGrinnell LP.
   4. System Sensor.
   5. Or equal.

B. General Requirements for Notification Appliances: Individually addressed, connected to a signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.

C. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

D. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

E. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.

F. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

G. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output:
   a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

2.10 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.11 ADDRESSABLE INTERFACE DEVICE

A. General:

1. Include address-setting means on the module.
2. Store an internal identifying code for control panel use to identify the module type.
3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to circuit-breaker shunt trip for power shutdown.

1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.

2.12 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.13 NETWORK COMMUNICATIONS

A. Provide network communications for fire-alarm system according to fire-alarm manufacturer's written requirements.

B. Provide network communications pathway per manufacturer's written requirements and requirements in NFPA 72 and NFPA 70.

C. Provide integration gateway using BACnet for connection to building automation system.

2.14 SYSTEM PRINTER

A. Printer shall be listed and labeled as an integral part of fire-alarm system.

2.15 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by device manufacturer.
2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before all other trades have completed cleanup shall be replaced.
2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Equipment Mounting: Install fire-alarm control unit on finished floor.

1. Comply with requirements for seismic-restraint devices per manufacturer's recommendation.

C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1980 mm) above the finished floor.

1. Comply with requirements for seismic-restraint devices per manufacturer's recommendation.

D. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.
2. Mount manual fire-alarm box on a background of a contrasting color.
3. The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.

E. Smoke- or Heat-Detector Spacing:

1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet (9 m).
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A in NFPA 72.
5. HVAC: Locate detectors not closer than 36 inches (910 mm) from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

F. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches (9100 mm) long shall be supported at both ends.

1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

H. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.

I. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

J. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

K. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

L. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling. Install all devices at the same height unless otherwise indicated.

M. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.3 PATHWAYS

A. Pathways above recessed ceilings and in nonaccessible locations may be routed exposed.

1. Exposed pathways located less than 96 inches (2440 mm) above the floor shall be installed in EMT.

B. Pathways shall be installed in EMT.

C. Exposed EMT shall be painted red enamel.

3.4 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches (910 mm) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
3. Smoke dampers in air ducts of designated HVAC duct systems.
4. Alarm-initiating connection to elevator recall system and components.
5. Alarm-initiating connection to activate emergency lighting control.
6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
7. Supervisory connections at valve supervisory switches.
8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
9. Supervisory connections at elevator shunt-trip breaker.
10. Data communication circuits for connection to building management system.
11. Data communication circuits for connection to mass notification system.
12. Supervisory connections at fire-extinguisher locations.
13. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
14. Supervisory connections at fire-pump engine control panel.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Perform tests and inspections.

C. Perform the following tests and inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
    b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Include visual inspections according to the "Visual Inspection Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
2. Perform tests in the "Test Methods" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Perform tests per the "Testing Frequencies" table in the "Testing" paragraph of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.9 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

END OF SECTION

SECTION 31 00 00

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation to District or City for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED DOCUMENTS

A. Section 31 10 00 – Site Clearing: (Inlet protection).

B. Section 31 20 00 – Earthwork: (Permanent grade changes for erosion control).

C. Erosion Control Plans.

1.03 REFERENCES

A. ASTM D 3786 - Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method

B. ASTM D 4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus; 2002

C. ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a.

D. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 1991 (Reapproved 1996).

E. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 1999a.

F. EPA 832-R-92-005 - Storm Water Management for Construction Activities; U.S. Environmental Protection Agency; 1992.

G. California Storm Water Quality Association (CASQA) – BMP Construction Handbook (2009).

H. The City of San Diego Storm Water Standards Manual, January 14, 2011.

1.04 PERFORMANCE REQUIREMENTS

A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control.

B. Best Management Practices Standard: EPA 832-R-92-005.

C. Best Management Practices Standard: CASQA Best Management Practices Construction Handbook.

D. Follow Water Pollution Control Plan (WPCP) requirements and enforce as required throughout the construction schedule. Verify on a weekly basis (or as noted in the WPCP) that the requirements of the WPCP are in place and enforced to protect the applicable site.

E. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

F. Provide to District or City (if required by governing district or City) a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 110 percent of the cost of erosion and sedimentation control work.

G. Timing: Put preventive measures in place as noted in the WPCP and/or The City of San Diego Storm Water Standards Manual.

H. Storm Water Runoff: Control increased storm water runoff due to construction activities for this project.
   1. Prevent runoff from directly entering storm drain and associated structures. Use gravel or sand bags, fiber roles or other suitable measures as shown on the erosion control plans and WPCP.

I. Erosion on Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
   2. Prevent development of ruts due to equipment and vehicular traffic.
   3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to governing District or City. Comply with provisions outlined in the WPCP and The City of San Diego Storm Water Standards Manual at all times.

J. Erosion off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.
   3. Prevent mud and sediment from flowing onto sidewalks and pavements.
   4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to governing District or City. Comply with provisions outlined in the WPCP and The City of San Diego Storm Water Standards Manual at all times.

K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to District or City; remove deposited sediments; comply with requirements of authorities having jurisdiction.

L. Open Water: Prevent standing water that could become stagnant.

M. Maintenance: Maintain temporary preventive measures until permanent measures have been established. Comply with provisions outlined in the WPCP and The City of San Diego Storm Water Standards Manual at all times.

N. Best Management Practices Standard: California Storm Water Quality Association (CASQA) – BMP Construction Handbook (2009).

PART 2 PRODUCTS

2.01 MATERIALS

A. Gravel bags:
   1. Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd2, Mullen burst strength exceeding 300 lb/in2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

2. Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and weight of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.
3. Fill material should be 0.5 to 1 in. gravel, clean and free from clay, organic matter, and other deleterious material.

B. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D 4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D 4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D 4632.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D 4533.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

C. Fiber rolls: Either prefabricated rolls or rolled tubes of erosion control blanket.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible. Comply with provisions outlined in the WPCP and The City of San Diego Storm Water Standards Manual at all times.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface with corrugated steel shaker plates.

C. Linear Sediment Barriers: Made of silt fences, fiber rolls, or gravel bags as indicated.

D. Storm Drain Catch Basins: Protect each inlet or catch basin using one of the following measures:
1. Gravel bags placed as indicated.
2. Fiber roles in according to the manufacturer’s recommendations.

E. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

F. Soil Stockpiles: Protect using one of the following measures:
1. Cover with polyethylene film, secured by placing soil on outer edges.
2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

G. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

A. Traffic-Bearing Aggregate Surface:
   1. Excavate minimum of 12 inches.
   2. Place and compact at least 12 inches of greater than 3-inch but smaller than 6-inch crushed aggregate.

B. Silt Fences: Install as indicated.

C. Temporary Seeding:
   1. When hydraulic seeder is used, seedbed preparation is not required.
   2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
   3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
   4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
   5. Incorporate fertilizer into soil before seeding.
   6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
   7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
   8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall. Comply with provisions outlined in the WPCP and The City of San Diego Storm Water Standards Manual at all times.

B. Repair deficiencies immediately.

C. Silt Fences:
   1. Promptly replace fabric that deteriorates unless need for fence has passed.
   2. Remove silt deposits that exceed one-third of the height of the fence.
   3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Gravel Bags:
   1. Promptly replace bags that fall apart or otherwise deteriorate unless need has passed.
   2. Remove silt deposits that exceed one-half of the height of the bags.
   3. Repair bag rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by City.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

3.07 ENFORCEMENT

A. Any fines levied against the City for non-compliance of Best Management Practices by agencies having jurisdiction over enforcement shall be paid by the Contractor. Remedial action for violations shall be immediate and to the satisfaction of the enforcing agency to avoid construction delays.

END OF SECTION

SECTION 31100

SITE CLEARING

PART 1 GENERAL

1.01 SUMMARY

This Section covers the requirements for site clearing, including clearing and grubbing, rubbish removal, stockpiled debris, sawcutting, demolition and removal of existing asphalt and concrete pavements, existing curb and gutter, onsite abandoned utilities and other items as shown on the plans and as specified below in preparation for earthwork operations.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Standard Specifications:

1. Standard Specifications for Public Works Construction (2012 Edition), "Greenbook", including the latest edition of the City of San Diego Regional Standard Specifications for Public Works Construction (Whitebook) 2012 Edition.

B. Standard Drawings:

1. City of San Diego Standard Drawings for Public Works Construction, 2012 Edition.

1.03 DESCRIPTION

The work includes clearing and grubbing as defined in Sections 300-1.1, 300-1.2, and 300-1.3 of the Greenbook Standard Specifications. Existing vegetation, shrubs, and other items within the area of work shall be removed under this item of work.

1.04 SITE INSPECTION AND LOCATION OF EXISTING ON-SITE UTILITIES:

Prior to all work of this Section, carefully inspect the entire site and all existing items to be demolished and removed or to be left intact, and determine an orderly sequence for the performance of this work. Exact locations and alignment of existing buried utility lines are not known. Locate all existing utility lines and determine the requirements for connection/disconnection, capping or removal. Locate all active utilities traversing the area of work to be retained and determine the requirements for protection. Locate all points of connection and crossings by potholes and determine exact horizontal and vertical location prior to commencing the work.

The Contractor is responsible to accurately locate, by potholing or other suitable methods, all existing utilities and substructures as shown on the plans and marked out by Underground Service Alert (USA), to prevent damage to such facilities and to identify any conflicts with the proposed work.

There will be no other compensation for potholing at any specific location required by the plans. Neither will showing some specific locations on the plans relieve the Contractor of the responsibility to pothole as previously mentioned in this Subsection.

The Contractor shall notify the engineer in writing of any conflicts between existing utilities and the proposed work a minimum of five (5) working days prior to commencement of construction activities.

The written notification shall include; date of utility location, method of utility location, type, size, and material of utility, horizontal location (to the nearest station), depth from existing pavement or ground surface to top and bottom of utility, suspected ownership of utility, and the date on which any conflict with the utility will impact the Critical Path.

For existing utilities shown on the plans or marked out by USA, the Contractor shall not be entitled to an extension of contract time or compensation for delay if direction is provided by the Engineer within five (5) working days from receipt of the Contractor's written notification of the utility conflict. If the Engineer does not provide direction to the Contractor within the five (5) working days, an extension of contract time may be granted in accordance with Greenbook and Whitebook Section 6-6.2 beginning on the sixth (6th) working day after receipt of the Contractor's written notification.

1.05 PROTECTION

A. The Contractor shall notify Dig Alert at 1-800-422-4133 at least two days prior to starting work and shall coordinate all work with utility company representatives. The existence and locations of existing underground facilities shown on the drawings were obtained from a search of available records. The Contractor shall take precautionary measures to protect any existing facility shown on the drawings, and any other which is not of record or not shown on the drawings.

B. Dewatering: Provide for the disposal of surface and subsurface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include the rerouting of any storm water runoff or natural drainage, if necessary, and shall comply with requirements of the **city/county** and the California State Water Resource Control Board.

C. Protection and Restoration of Surface: Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Provide erosion control to prevent water-borne soil from leaving the work area by means of straw bale dikes or sand bags. The Contractor shall be responsible to clean up any soil deposited in the public right-of-way or on adjacent property. The Contractor shall be responsible to protect storm drain catch basins with sand bags and to prevent sediment from entering the storm drain system during construction.

1.06 RELATED WORK IN OTHER SECTIONS

The following work specified in other sections applies to the work of this Section, including but not limited to:

A. Div 1 as if fully repeated here in.

B. Division 32 and 33.

1.07 SAFETY DURING CONSTRUCTION

The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property. This requirement shall be made to apply continuously and not be limited to normal working hours. Refer to Part Three of this Section and Division 1 for additional requirements

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

3.01 GENERAL

A. Perform all clearing and grubbing as defined in Section 300-1.1, 300-1.2, and 300-1.3 of the Greenbook Standard Specifications for Public Works Construction and as described in this Section.

B. Coordinate clearing and grubbing with the requirements of Div 31, "Earthwork for Structures and Pavement".

C. The Contractor shall protect existing improvements and landscape outside the limits of work.

D. The Contractor shall exercise care to avoid damage to existing improvements to remain.

E. The Contractor shall take all means to avoid the spread of dust to adjacent property or the public right-of-way. The Contractor shall be responsible for street sweeping and cleaning of the public right-of-way and adjacent property.

F. Provide weather protection during the construction period to prevent erosion or sedimentation onto the public right-of-way or adjacent property.

G. Prior to all work of this section, carefully inspect the entire site and all existing items to be demolished and removed or to be left intact, and determine an orderly sequence for the performance of this portion of the work. Locate all existing utility lines and determine the requirements for disconnection and capping. Locate all active utilities traversing the area of work to be retained and determine the requirements for protection.

H. Disconnection and protection of utilities: Preserve in operating condition all active utilities traversing the site and servicing adjacent structures. Protect all property including, but not necessarily limited to mains, manholes, catch basins, valve boxes, poles, guys, and other appurtenances.

END OF SECTION

SECTION 31 20 00

EARTHWORK FOR STRUCTURES AND PAVEMENTS

PART 1 GENERAL

1.01 SUMMARY

This Section covers the requirements for earthwork including remedial grading, cut and fill operations and materials, removal of unsuitable soils, import of select soil materials, disposition of onsite unsatisfactory material and debris. It is the responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with these specifications unless more stringent requirements required in the geotechnical report and any applicable grading codes and local agency ordinances.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Standard Specifications:

1. Standard Specifications for Public Works Construction (2012 Edition), "Greenbook", including the latest edition of the City of San Diego Regional Standard Specifications for Public Works Construction (Whitebook) 2012 Edition.

B. Geotechnical Report: A Geotechnical Report has been prepared for this project **(Geotechnical Exploration Report Project No. 107275001 dated March 23, 2012** and **Subgrade Prep. & Base Course for Permeable Pavers dated November 6th, 2012 by Ninyo Moore)** See documents for minimum soil prep and re-compaction.

C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb f/ft (2,700 kN - m/m))
ASTM D2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

1.03 DESCRIPTION

The work includes performing site preparation, remedial grading, excavation, removal of unsuitable soils, importing select soil materials (if required), filling, backfilling, compacting, and finished grading necessary to construct the finished grades indicated for structures, pavements, and other on-grade slabs or site work. The Contractor shall provide survey services as specified herein. Requirements for excavating and backfilling for utility lines or storm drains are contained in Section 31 22 50, "Excavation, Backfilling, and Compacting for Utilities". Requirements for pavement base course and surface courses as well as for foundation and footing construction are specified in the respective sections for these systems.

1.04 DEFINITIONS

A. Backfill: Material used in refilling a cut or other excavation.

B. Capillary Water Barrier: A layer of clean, poorly graded crushed rock stone, or natural sand or gravel having a high porosity which is placed beneath a building slab with or without a vapor barrier to cut off the capillary rise of pore water to the area immediately below a slab.

C. "Soil" Fills: Soil fills are defined as fills containing no rocks or hard lumps larger than 6" in maximum dimensions and containing at least 40% by weight of material smaller than 3/4" in size.

D. Compaction: The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D-1557 for general soil types abbreviated in this specification as "(amount indicated)% ASTM D-1557 maximum density".

E. Embankment: A "fill" having a top that is higher than adjoining ground.

F. Excavation: The removal of soil, rock or hard material to obtain a specified depth or elevation.

G. Fill: Specified material placed at a specified degree of compaction to obtain an indicated grade or elevation.

H. Lift: A layer (or course) of soil placed on top of a previously prepared or placed soil in a fill or embankment.

I. Soil: The loose surface material of the earth's crust resulting from the chemical and mechanical weathering of rock and organic material.

J. Subgrade: The bottom layer of material (sometimes in-situ soils or rock) graded or otherwise prepared for supporting the addition of fill material, pavement courses, or building footings and slabs.

K. Unsatisfactory Material: Existing, in-place soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability. Materials classified as PT, OH, or OL by ASTM D-2487 are unsatisfactory. Unsatisfactory materials also include existing undocumented fill soils, any expansive clays, decomposable or organic debris, rubber tires, metal and plastic. Expansive soils are soils with an expansive index greater than 30 when tested by UBC Test Standard 29-2.

L. Debris: Existing materials such as asphalt, concrete, glass and other non-organic items that are present in some on-site fill areas.

M. Remedial Grading: Over excavation, removal and/or re-compaction of existing soils under proposed improvements.

1.05 DELIVERY AND STORAGE

Deliver and store materials in a manner to prevent contamination or segregation.

1.06 SITE INSPECTION AND LOCATION OF EXISTING ON-SITE UTILITIES:

Prior to all work of this Section, carefully inspect the entire site and all existing items to be demolished and removed or to be left intact, and determine an orderly sequence for the performance of this work. Exact locations and alignment of existing buried utility lines are not known. Locate all existing utility lines and determine the requirements for disconnection and capping. Locate all active utilities traversing the area of work to be retained and determine the requirements for protection. Locate all points of connection and crossings by potholes and determine exact horizontal and vertical location prior to commencing the work. Requirements for site clearing are contained in Section 31 10 00, "Site Clearing".

1.07 PROTECTION

A. The Contractor shall notify Dig Alert at 1-800-422-4133 at least two days prior to starting work and shall coordinate all work with utility company representatives. The existence and locations of existing underground facilities shown on the drawings were obtained from a search of available records. The Contractor shall take precautionary measures to protect any existing facility shown on the drawings, and any other which is not of record or not shown on the drawings.

B. Shoring: The California Division Occupational Safety and Health Enforces the requirement that building and construction contractors obtain a permit prior to commencing certain types of hazardous activity, as specified in Section 65000 of the State Labor Code and Section 341 of Title 8 of the California Code of Regulations. These activities include construction of trenches or excavations which are 5' or deeper and into which a person is required to descend, the construction or demolition of any building, structure, falsework, or scaffolding more than three stories high or the equivalent height, and the underground use of diesel engines in work in mines and tunnels. Construction permits are issued by district offices of the division. The San Diego office is located at:

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
7575 Metropolitan Drive, Suite 207
San Diego, CA 92108
(619) 767-2280

C. Dewatering: Provide for the disposal of surface and subsurface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include the rerouting of any storm water runoff or natural drainage, if necessary, and shall comply with requirements of the **City/County** and the San Diego Regional Water Quality Control Board.

E. Protection and Restoration of Surface: Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Provide erosion control to prevent water-borne soil from leaving the work area by means of straw bale dikes or sand bags. The Contractor shall be responsible to clean up any soil deposited in the public right-of-way or on adjacent property. The Contractor shall be responsible to protect storm drain catch basins with sand bags and to prevent sediment from entering the storm drain system during construction.

1.08 RELATED WORK IN OTHER SECTIONS

The following work specified in other sections applies to the work of this Section, including but not limited to:

A. Div 1 as if fully repeated here in.

B. Div 32.

1.09 SAFETY DURING CONSTRUCTION

The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property. This requirement shall be made to apply continuously and not be limited to normal working hours. Refer to Part Three of this Section and Division 1 for additional requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. On-site soils: The on-site soils consist of pavement subgrade and existing conditions **per the geotechnical report located in the appendix of this Technical Specifications.** Materials and methods utilized in this project shall be as follows unless more restrictive materials are specified in the **geotechnical report or the civil drawings**.

B. Select Granular Import Soils: **see geotechnical report**

C. Material to be placed as fill shall be sufficiently free of organic matter and other deleterious substances, and shall be evaluated by the Geotechnical Engineer prior to placement. Soils of poor gradation, expansion or strength characteristics shall be placed as recommended by the Geotechnical consultant or mixed with other soils to achieve satisfactory fill material.

D. Oversize Material: Oversize material, defined as rock or other irreducible material with a dimension of 6" or larger, shall not be buried or placed in shallow fills. Material greater than 3” in maximum dimension shall not be placed in top 12-inches of pavement subgrade.

PART 3 EXECUTION

3.01 SITE PREPARATION

Prior to grading, the site shall be cleared of surface and subsurface obstructions, including any existing debris, and stripped of vegetation in accordance with Section 31 10 00, "Site Clearing". Removed vegetation and debris shall be disposed of off site. Holes resulting from removal of buried obstructions which extend below finish grades shall be replaced with suitable compacted fill material. All areas to receive fill and/or other near surface improvements shall be scarified to a minimum depth of 6-inches, moisture conditioned, to or near optimum moisture conditions, and recompacted to a minimum of 90% relative compaction, based on ASTM Test Method D1557-91.

3.02 REMEDIAL GRADING

A. Under Building: The building footprint and area **5-feet** beyond the building shall be overexcavated to a minimum depth of **see geotechnical report** below lowest footing elevations. The exposed subgrade shall be observed by the Geotechnical Engineer and any additional recommendations made. Scarify and recompact subgrade prior to placing fill. Place fill in 8 inch maximum lifts and compact to 90% relative compaction per ASTM D 1557-91. Existing site soils may be reused as compacted fill if they meet requirements specified herein.

B. Under Asphalt and Concrete Vehicle Pavement Areas: **see geotechnical report**

C. Under Non – Vehicle Hardscape Areas: **see geotechnical report**

D. Under Permeable Paving System: **see geotechnical report**

3.03 COMPACTION REQUIREMENTS

A. Sub-grade soils: **see geotechnical report**

3.04 FINISH OPERATIONS

A. Site Grading: Grade to finished grades indicated within 0.10 foot. Grade areas to drain water away from structures. Existing grades which are to remain but are disturbed by the Contractor's operations shall be restored as specified herein.

B. Finishing Subgrades under Structures and Pavements: Finish the surface of the top lift of the fill or top of the subgrade to the elevation and cross section indicated. The finished surface shall be smooth and of uniform texture. Lightly scarify or blade the finished surface to bring the finished surface to within 0.05' of the indicated grade and to eliminate imprints made by the compaction and shaping equipment. The surface shall show no deviations in excess of 3/8" when tested with a 10' straightedge.

3.05 DISPOSITION OF SURPLUS MATERIAL

A. Unsatisfactory Material and Debris: All unsatisfactory material and any debris material shall be removed from the site to a location approved by the City/County of San Diego.

3.06 PROTECTION OF SURFACES

Protect newly graded areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes prior to acceptance of work.

3.07 SOIL TESTING

A. Soil testing during construction shall be performed by a Geotechnical Testing Laboratory. Reference Div 1, "Testing" for specific requirements. Materials and operations under this Section shall be monitored by qualified Geotechnical Laboratory personnel under the direction of a Geotechnical Engineer. In general, no more than 1 foot of soil in vertical elevation shall be placed without at least one field density test being made within that interval. In addition, a minimum of one field density test shall be made for every 200 cubic yards of soil fill placed and compacted, unless directed otherwise by the Geotechnical Engineer.

B. The Geotechnical Engineer shall make random field density tests of the compacted soil fill to provide a basis for expressing an opinion as to whether the fill material is compacted as specified. The basis for its opinion that the fill material has been compacted to at least the minimum relative compaction specified shall be that no tests in compacted or recompacted fill areas indicate a relative compaction of less than that specified. Density tests shall be made in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

C. Prior to placement of concrete, footing excavations and fill placement shall be observed and tested by the Geotechnical Engineer.

D. The Contractor shall be responsible for any rework necessary to achieve the specified densities to the satisfaction of the Geotechnical Engineer.

3.08 SURVEY SERVICES

A. The Contractor shall be responsible for procuring all surveying services as may be required for construction. All construction surveying services shall be provided by a licensed land surveyor or registered civil engineer licensed to practice land surveying.

B. Contractor will be required to hire a California licensed land surveyor to certify the building pad prior to foundation, slab placement, and related form work required by governing agency.

END OF SECTION

SECTION 31 22 50

EXCAVATING, BACKFILLING & COMPACTING FOR UTILITIES

PART 1 GENERAL

1.01 SUMMARY

This section includes requirements for excavating, preparation of pipe-laying surface, pipe bedding, backfilling and compaction for the piping systems furnished and installed under related Div 32.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Standard Specifications:

1. Standard Specifications for Public Works Construction (2012 Edition), "Greenbook", including the latest edition of the City of San Diego Regional Standard Specifications for Public Works Construction (Whitebook) 2012 Edition.

B. Standard Drawings:

1. City of San Diego Standard Drawings for Public Works Construction, 2012 Edition.

C. Geotechnical Report: A Geotechnical Report has been prepared for this project **(Geotechnical Exploration Report Project No. 107275001 dated March 23, 2012 and Subgrade Prep. & Base Course for Permeable Pavers dated November 6th, 2012 by Ninyo Moore)** See documents for minimum soil prep and recompaction.

D. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D1556 (1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D1557 (1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft (2,700 kN - m/m))

ASTM D2487 (1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D2922 (1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

ASTM D3017 (1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.03 DESCRIPTION

The work includes excavation, preparation of pipe laying surface, pipe bedding, backfilling and compaction as specified herein, for the piping systems furnished and installed under related Divisions 32. The work also includes protection as specified herein, installation of buried warning and identification tape.

1.04 DEFINITIONS

A. Backfill: Material used in refilling a trench or other excavation.

B. Compaction: Any method of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D1557 for general soil types, abbreviated in this specification as "(amount indicated)% ASTM D1557 maximum density."

C. Embankment: A "fill having a top that is higher than adjoining ground."

D. Fill: Specified material placed at a specified degree of compaction to obtain an indicated grade or elevation.

E. Granular Pipe Bedding: Sand, gravel or crushed aggregate as indicated in referenced Standard Drawing.

F. Hard Material: Weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

G. Lift: A layer or course of soil placed on top of prepared subgrade or a previously prepared or placed soil in a fill or backfill.

H. Rock: Solid Homogenous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume.

I. Unyielding Material: Rock or soil with cobbles in the trench bottom requiring a covering of finer grain material or special bedding to avoid bridging in the pipe or conduit.

J. Unsatisfactory Material: Soil or other material identified as having insufficient strength or stability to carry intended loads on trench backfills without excessive consolidation or loss of stability. Also backfill material which contains refuse, large rocks, debris, and other Material which could damage the pipe or cause the backfill not to compact. Materials classified as PT, OH, or OL by ASTM D24-87 are unsatisfactory.

K. Unstable Material: Material in the trench bottom which lacks firmness to maintain alignment and prevent joints from separating in the pipe, conduit or appurtenance structure during backfilling. This may be material otherwise identified as satisfactory which has been disturbed or saturated.

1.05 SUBMITTALS

A. Field Test Reports: Submit within 14 days of test date.

B. Shoring Plan: The Contractor shall submit a shoring plan prepared in accordance with applicable CAL-OSHA requirements to the Owner's representative for review prior to commencing the work.

1.06 SITE INSPECTION AND LOCATION OF EXISTING ON-SITE UTILITIES:

Prior to all work of this Section, carefully inspect the entire site and all existing items to be demolished and removed or to be left intact, and determine an orderly sequence for the performance of this work. Exact locations and alignment of existing buried utility lines are not known. Locate all existing utility lines and determine the requirements for disconnection and capping. Locate all active utilities traversing the area of work to be retained and determine the requirements for protection. Locate all points of connection and crossings by potholes and determine exact horizontal and vertical location prior to commencing the work.

1.07 PROTECTION

A. The Contractor shall notify Dig Alert at 1-800-422-4133 at least two days prior to starting work and shall coordinate all work with utility company representatives. The existence and locations of existing underground facilities shown on the drawings were obtained from a search of available records. The Contractor shall take precautionary measures to protect any existing facility shown on the drawings, and any other which is not of record or not shown on the drawings.

B. For all work related to water utilities, the Contractor shall coordinate all work with Water District.

C. Shoring: The California Division Occupational Safety and Health Enforces the requirement that building and construction contractors obtain a permit prior to commencing certain types of hazardous activity, as specified in Section 65000 of the State Labor Code and Section 34-1 of Title 8 of the California Code of Regulations. These activities include construction of trenches or excavations which are 5' or deeper and into which a person is required to descend, the construction or demolition of any building, structure, falseworks or scaffolding more than three stories high or the equivalent height, and the underground use of diesel engines in work in mines and tunnels. Construction permits are issued by district offices of the division. The San Diego office is located at:

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
7575 Metropolitan Drive, Suite 207
San Diego, CA 92108
(619) 767-2280

1. This project includes trenching in excess of 5 feet in depth which will require a permit from the California Division of Occupational Safety and Health (CAL-OSHA), The Contractor shall be responsible for obtaining the appropriate permit and shall comply with the requirements of the permit, and with CAL-OSHA law.

The Contractor shall submit a shoring plan prepared in accordance with applicable CAL-OSHA requirements, to the Owner's representative for review prior to commencing the work.

D. Dewatering: Provide for the disposal of surface and subsurface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include the rerouting of any storm water runoff or natural drainage, if necessary, and shall comply with requirements of the **City/County** and the California State Water Resource Board.

E. Utilities: Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, use hand or light equipment excavation. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until backfill is completed. Report damage to any utility or subsurface improvements immediately to the Owner's Representative.

F. Structures and Surfaces: Protect newly backfilled areas and adjacent structures, slopes or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance. Provide erosion control to prevent water-borne soil from leaving the site, by means of straw bale dikes or sand bags. The Contractor shall be responsible to clean-up any soil deposited in the public right-of-way or on adjacent property.

G. Protection and Restoration of Surface: Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Provide erosion control to prevent water-borne soil from leaving the work area by means of straw bale dikes or sand bags. The Contractor shall be responsible to clean up any soil deposited in the public right-of-way or on adjacent property. The Contractor shall be responsible to protect storm drain catch basins with sand bags and to prevent sediment from entering the storm drain system during construction.

1.08 RELATED WORK IN OTHER SECTIONS

The following work specified in other sections applies to the work of this Section, including but not limited to:

A Div 1 as if fully repeated here in.

B. Div 32.

1.09 SAFETY DURING CONSTRUCTION

The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property. This requirement shall be made to apply continuously and not be limited to normal working hours. Refer to Part Three of this Section and Division 1 for additional requirements.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

Provide soil materials as described below free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, or other deleterious and objectionable materials. Materials and methods utilized in this project shall be as follows unless more restrictive materials are specified in the **geotechnical letter see appendix**.

A. Backfill: Bring trenches to grade indicated on the drawings using material excavated on the site of this project. This material shall be approved by the Geotechnical Engineer prior to use as backfill. The maximum size of material used for backfill shall not exceed 2 inches.

B. Bedding: Sand, gravel or crushed aggregate as indicated in the referenced Standard Drawing for the specific utility.

2.02 BURIED WARNING AND IDENTIFICATION TAPE

Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, Polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3" minimum width, color coded as stated below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing is to be permanent, unaffected by moisture or soil.

Warning Tape Color Codes

Blue: Water Lines, including Fire, Domestic and Irrigation
Green: Sewer Lines
White: Storm Drain Lines

A. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements indicated above. Minimum thickness of the tape shall be 0.003". Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise with a maximum 350% elongation.

B. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements indicated above. Minimum thickness of the tape shall be 0.004". Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. The tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a Metal detector when the tape is buried up to 3' deep. Encase the metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

PART 3 EXECUTION

3.01 GENERAL EXCAVATION

A. Keep excavations free from water while construction is in progress. Make trench sides as nearly vertical as practicable except where sloping of sides is allowed or required. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the utility. Excavate ledge rock boulders and other unyielding material to an overdepth at least 1 foot below the bottom of the utility unless otherwise indicated or specified on the drawings. Use sand placed in 6-inch maximum layers to refill overdepths to the

proper grade. Grade bottom of trenches accurately to provide uniform bearing and support for each section of utility on undisturbed soil, or bedding material as indicated or specified at every point along its entire length except for portions where it is necessary to excavate for bell holes and for making proper joints. Dig bell holes and depressions for joints after trench has been graded.

B. Dimensions of bell holes shall be as required for properly making the particular type of joint to ensure that the bell does not bear on the bottom of the excavations. Trench dimensions shall be as indicated or specified.

3.02 GENERAL BEDDING

A. Shall be of the materials and depths as indicated for the utility and utility structures. Place bedding in 6-inch maximum loose lifts to 1 foot above utility unless otherwise specified. Ensure that initially placed material is tamped firmly under pipe haunches. Bring up evenly on each side and along the full length of the structure. Ensure that no damage is done to structures or their protective coatings. Provide uniform and continuous support for each section of structure except at bell holes or depressions necessary for making proper joints.

3.03 BURIED WARNING AND IDENTIFICATION TAPE

A. Install tape in accordance with manufacturer's recommendations except as modified herein. Bury tape 6 inches below finished grade; under pavements bury tape 6 inches below top of subgrade.

3.04 GENERAL BACKFILLING

A. Place backfill on top of bedding material in 8-inch maximum loose lifts unless otherwise specified. Compact each loose lift as specified in paragraph "General Compaction" before placing the next lift. Do not backfill where the material in the trench is muddy, except as authorized. Where settlements greater than the tolerance allowed herein for grading occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact, the excavation as specified herein and restore the surface to the required elevation. Coordinate backfilling with testing of utilities: Complete all testing for utilities before backfilling.

3.05 GENERAL COMPACTION

A. Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging pipes and protective pipe coatings. Compact material in accordance with the following unless otherwise specified. If necessary, alter, change, or modify selected equipment or compaction methods to meet specified compaction requirements.

B. Compaction of Bedding and Backfill: Compact bedding and backfill material surrounding pipes to 90% of ASTM D1557 maximum density. Compact top 12-inches of bedding and backfill material to 95% under asphalt and concrete pavements.

3.06 SPECIAL EARTHWORK INSTALLATION REQUIREMENTS

A. Precast Meter Boxes, Catch Basins and Cast-in-Place Structures: Provide at least 12 inches clear from outer surfaces to the embankment or shoring. Remove rock as specified herein. Remove unstable soils that are incapable of supporting the structure to an overdepth of 1 foot and refill with gravel or sand to the proper elevation. Refill

overdepths with gravel or sand to the required grade and compact as specified. Set precast concrete structures on a minimum of 6 inches of gravel or sand material.

B. Grading: Finish to grades indicated within 0.10 foot. Grade areas to drain water away from structures. Grade existing grades that are to remain but have been disturbed by the Contractor's operations.

C. Protection of Surfaces: Protect newly graded areas from traffic, erosion, and settlements that may occur due to construction activity. Repair or reestablish damaged grades, elevations, or slopes.

D. Pavement Repair: Repair pavement, curbs, and gutters damaged during construction with new improvements. Do not repair pavement until trench or pit has been backfilled and compacted as herein specified. Provide a temporary road surface of gravel or crushed stone over the backfilled portion until permanent pavement is repaired. Remove and dispose of temporary road surface material when permanent pavement is placed.

3.07 SOIL TESTING

A. Soil testing during pipeline construction shall be performed by a Geotechnical Testing Laboratory. Reference Div 1, "Testing" for specific requirements. Materials and operations under this Section shall be monitored by qualified Geotechnical Laboratory personnel under the direction of a Geotechnical Engineer. In general, one field density test shall be made per lift for every 50 feet of trench backfill, unless directed otherwise by the Geotechnical Engineer.

B. The Geotechnical Engineer shall make random field density tests of the compacted backfill to provide a basis for expressing an opinion as to whether the backfill material is compacted as specified. The basis for this opinion shall be that no tests in compacted or recompacted backfill areas indicate a relative compaction of less than that specified. Density tests shall be made in the compacted materials below any disturbed surface. When these tests indicate that the density of any lift or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

C. The Contractor shall be responsible for any rework necessary to achieve the specified densities to the satisfaction of the Geotechnical Engineer.

END OF SECTION

SECTION 32 11 70

DRIVABLE GRASS/GRAVEL PAVERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Provide and install base as per Civil Engineer details on Drawings, to provide adequate support for project designs loads.
2. Provide pervious paver units, anchors and installation per the manufacturer's instructions.
3. Provide and install fine decorative gravel to fill the pervious paver units.

B. Related Work:
1. Subgrade preparation under Section 31 20 00 Earthwork.
2. Utilities and subsurface drainage - Section 32 72 00 - Storm Drain System.

1.02 SUBMITTALS

A. Submit manufacturer's product data and installation instructions.

B. Submit 4 pervious paver units for review.

C. Submit material certificates for base course and sand fill materials.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

1.03 QUALITY ASSURANCE

A. Installation: Performed only by skilled work people with satisfactory record of performance on landscaping or paving projects of comparable size and quality.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect pervious paver units from damage during delivery and store under tarp when time from delivery to installation exceeds one week.

1.06 SITE/PROJECT CONDITIONS

A. Review installation procedures and coordinate Pervious paver work with other work affected.

B. All hard surface paving adjacent to Pervious paver areas, including concrete walks and asphalt paving, must be completed prior to installation of Pervious paver.

C. Cold weather:
1. Do not use frozen materials or materials mixed or coated with ice or frost.
2. Do not build on frozen work or wet, saturated or muddy subgrade.

D. Protect partially completed paving against damage from other construction traffic when work is in progress.

E. Protect adjacent work from damage during Pervious paver installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

B. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

C. Manufacturer (Pervious paver): Soil Reteniton (800) 346-7995 www.soilretention.com or equal.

D. Base Course: As detailed on Drawings C-3.

E. Pervious Paver Units: Drivable Grass® permeable, flexible and plantable concrete pavement system or equal. Product shall be wet cast, lob moisture absorption concrete with holes cast into unit to allow for infiltration and root penetration. A cast-inside engineered polymer grid shall allow paver to flew and conform to irregular ground surface contours along pre-defined linear grooves, while providing the intended structural support .

1. Size: 24 inch by 24 inch by 1-1/2 inch.
2. Concrete Strength: 5,000 psi
3. Color: As selected by Architect and Resident Engineer.

F. Gravel Fill: Obtain clean, washed, fine decorative gravel, must be sharp and angular (not rounded) stone, granite hardness, to fill the 25 mm (1") high rings and spaces between the rings, not to be overfilled more than 1/4" (6 mm). Maximum Size of stone should be: 3/16" to 3/8" (5 mm to 10 mm) and uniform in size - not graded.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine subgrade and base course installed conditions. Do not start pervious paver installation until unsatisfactory conditions are corrected. Check for poor drainage, improperly compacted trenches, debris, and improper gradients.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, contact Resident Engineer for resolution.

3.02 PREPARATION

A. Place base course material over prepared subbase to grades shown on plans, in lifts not to exceed 150 mm (6"), compacting each lift separately to 95% Modified Proctor. Leave 1-1/2 inch for Pervious paver unit and gravel fill to Final Grade.

3.03 INSTALLATION OF PERVIOUS PAVER UNITS

A Install the Pervious paver units in accordance with manufacturer's printed instruction and by placing units stack bond with grid facing up. Maintain proper alignment between the units.

B. Install gravel into grid after the units are completely installed and approved by Architect and Resident Engineer by "backdumping" directly from a dump truck, or from buckets mounted on tractors, with a minimum depth to fill grid, then exit the site by driving forward over units already filled. Sharp turning of vehicles on ungraveled pavers must be avoided. The gravel is then spread laterally from the pile using power brooms, blades, flat bottomed shovels and/or wide "asphalt rakes" to fill the grid. A stiff bristled broom should be used for final "finishing". The gravel should be "compacted", if necessary, by using a vibrating plate or small roller, with the finish grade no less than the top of grid.

3.03 CLEANING

A. Remove and replace segments of pervious paver units where pavers are broken or damaged, reinstalling as specified, with no evidence of replacement.

B. Perform cleaning during the installation of work and upon completion of the work. Remove all excess materials, debris, and equipment from site. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

C. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 32 23 30

GRADED CRUSHED AGGREGATE BASE COURSE FOR PAVEMENTS

PART 1 GENERAL

1.01 SUMMARY

The work includes placement of aggregate base course for pavements and structures as indicated. Class 2 Material, meeting Caltrans requirements, may be used in lieu of crushed aggregate base as specified.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Standard Specifications:

1. Standard Specifications for Public Works Construction (2012 Edition), "Greenbook", including the latest edition of the City of San Diego Regional Standard Specifications for Public Works Construction (Whitebook) 2012 Edition.

2. California Department of Transportation U.S. Customary Standard Specifications, 2010 Edition.

B. Standard Drawings:

1. City of San Diego Standard Drawings for Public Works Construction, 2012 Edition.

2. California Department of Transportation U.S. Customary Standard Specifications, 2010 Edition.

C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C136	(1993) Sieve Analysis of Fine and Course Aggregates
ASTM D1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft (2,700 kN - m/m))
ASTM D2172	(1993) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

1.04 QUALITY ASSURANCE

Materials and workmanship specified herein with the referenced Greenbook Standard Specifications and California Department of Transportation U.S. Customary Standard Specifications, 2010 Edition shall be in accordance with the referenced articles, sections and paragraphs of the standard except that contractual and payment provisions do not apply.

1.05 SITE INSPECTION AND LOCATION OF EXISTING ON-SITE UTILITIES:

Prior to all work of this Section, carefully inspect the entire site and all existing items to be demolished and removed or to be left intact and determine an orderly sequence for the performance of this work Exact locations and alignment of existing buried utility lines are not known. Locate all existing utility lines and determine the requirements for disconnection and capping. Locate all active utilities traversing the area of work to be retained and determine the requirements for protection. Locate all points of connection and crossings by potholes and determine exact horizontal and vertical location prior to commencing the work.

1.06 PROTECTION

A. Protection and Restoration of Surface: Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Provide erosion control to prevent water-borne soil from leaving the work area by means of straw bale dikes or sand bags. The Contractor shall be responsible to clean up any soil deposited in the public right-of-way or on adjacent property. The Contractor shall be responsible to protect storm drain catch basins with sand bags and to prevent sediment from entering the storm drain system during construction.

1.07 RELATED WORK IN OTHER SECTIONS

The following work specified in other sections applies to the work of this Section, including but not limited to:

A. Div 1 as if fully repeated here in.

B. Div 31

1.08 SAFETY DURING CONSTRUCTION

The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property. This requirement shall be made to apply continuously and not be limited to normal working hours. Refer to Part Three of this Section and Division 1 for additional requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed Aggregates Base Course

1. Base Course Materials shall comply with Section 200-2.2 of the Greenbook Specifications for 3/4" maximum aggregate.

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PART 3 EXECUTION

3.01 PREPARATION

Subgrade: Requirements for subgrade are specified in Section 31 20 00, "Earthwork for Structures and Pavements". Prior to construction of base course, clean previously constructed subgrade of foreign substances.

3.02 INSTALLATION

A. Aggregate Base Course Installation: Place aggregate base in accordance with requirements of Section 301-2 of the Greenbook Specifications. Grade and compact in layers to at least 95% of maximum density (ASTM D-1557). Maintain base course in proper condition until Portland cement concrete is in place, including drainage, rolling, shaping, and watering. Maintain sufficient moisture at the surface to prevent a dusty condition by light sprinkling with water. Recondition, reshape, and recompact areas of completed base course damaged in accordance with the specified requirements.

B. Aggregate Base Course thickness shall be as indicated.

3.03 FIELD QUALITY CONTROL

Soil testing during construction shall be performed by a Geotechnical Testing Laboratory as specified in Div 1, "Testing ". Contractor shall coordinate with Resident Engineer's testing laboratory.

All material testing shall be performed by the Geotechnical Engineer. The following tests shall be performed:

A. Base Course Finish Surface: Surface tolerance shall conform to Section 301-2.3 of the Greenbook Specifications. When base course is constructed in more than one layer, specified smoothness requirements apply only to top surface.

B. Gradation: Perform base course gradation test in accordance with ASTM C136. Make one test for each 100 tons of material.

C. Base Course Density: Perform in place density tests in accordance with ASTM D1557. Make one maximum density test for each gradation. Make one set of two tests each for in place density for each 200 square yards of surface area. In place density of aggregate base course shall be at least 95% of the laboratory maximum density.

END OF SECTION

SECTION 32 31 19

ORNAMENTAL FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Wrought Iron Fencing.
2. Wrought iron swing gates, both electrically operated and manually operated with latches as indicated on Drawings.
3. Wrought iron electrically operated rolling gate.

B. Related Sections:
1. Section 32 31 40 - Gate Operators

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings showing layouts, dimensions, construction details and installation, including fastening devices.

B. Products Form: In accordance with Section 01 33 00, prior to installation in the project, submit a completed products form, Section 00 62 33, for each product which contributes to the points required for LEED™ Certification. Information contained on the Products Forms shall be used to complete the information required for the LEED Submission.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.
2. Provide local/regional materials in accordance with Local/Regional Materials provisions of Section 01 60 00.

B. Steel: Commercial quality steel conforming to ASTM A36, hot-rolled sections for bars, angles, channels and other miscellaneous steel. Basic shapes shall be cold-rolled and electrically welded.

C. Steel Pipe: ASTM A53.

D. Tube: ASTM A500, Grade B.

E. Gray Iron Castings: ASTM A48, Class 30.

F. Malleable Iron Castings: ASTM A47, Grade 32510.

G. Anchor and Expansion Bolts: ASTM A307 anchor bolts, unless otherwise noted. Expansion bolts to have I.C.B.O. rating for material into which the installation takes place. Furnish anchor and expansion bolts with steel washers.

H. Paint: Powder coat paint with TGIC Polyester Coating. Paint colors per plans.

2.02 FABRICATION

A. Construction shall be shop welded by Arc-gas shield weld for smooth, clean, slag-free welds. Grind welds smooth. Completely prime and paint. Posts, pickets and rails sizes and shapes shall be as shown on the Drawings.

B. Gates:
1. Prepare gates as shown or required for hardware provided by others.
3. Hinges: Non-lift off type, offset to allow 180 degree gate opening.
4. Provide and install roller guides, tracks, rails, guides, support angles, etc., as required for smooth operation of rolling and sliding gates.
5. At sliding gates, include a 1-1/2 inch x 1-1/2 inch x 3/16 inch guide angle cast into a 1'-0" wide x 1'-6" thick concrete pad running the full length of the wheel travel.
6. Wheels: 4" dia x 3" wide Delrin 'V' groove roller, ball bearing..

C. Insulate contact joints between dissimilar materials to prevent electrolytic or corrosive action.

2.03 SHOP PAINTING

A. Thoroughly clean iron and metal to be primed of scale, dirt and dust by steel scraper, wire brushes or sandblasting.

B. All components shall be powder coated after complete fabrication with triglycidyl isocyanurate (TGIC) powder, a polyester coating. To insure powder coat adhesion, steel must be free of any scale, paint, varnish, or rust. Substrate preparation prior to powder coating is to include a chemical wash and rinse followed with an iron phosphate treatment. Finished product shall appear bright and smooth, with a refined appearance.

PART 3 EXECUTION

3.01 INSTALLATION

A. Anchor posts in concrete footings or attach to masonry walls as shown on the Drawings.

B. Securely anchor gates and erect plumb, level, and true, with smooth operating hardware.

C. Touch up abrasions, bolts, rivets, welds and other spots after erection with the same type of paint as used for shop coat.

3.02 CLEANING

A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19.

END OF SECTION

SECTION 32 31 40

GATE OPERATOR

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:
1. Section 32 31 19 - Ornamental Fences and Gates
2. Division 26 - Electrical

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, design data and installation instructions.

B. Shop Drawings: Submit drawings showing layout, dimensions and construction details, including wiring diagram.

C. Contract Closeout Submittals: Submit Manual for care and operation in accordance with Section 01 77 00.

1.03 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.

B. Storage: Adequately protect against damage while stored at the site.

C. Handling: Comply with manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Furnish products of one of the following manufacturers, except as approved by the Architect and Resident Engineer, subject to compliance with specifications requirements:
1. Elite (www.gateoperator.com) (Basis of Design)
2. Stanley Automatic Operators, Div. of The Stanley Works (www.mhfence.com)
3. Edko (www.edko.com)
4. Crown Industrial (www.crown-industrial.com)
5. GTO (www.gtoinc.com)
6. Or equal.

B. Specifications are based on products as manufactured by Elite.

2.02 SWING GATE OPERATOR

A. Operator: Model SW 2000-UL-1 (one horsepower) as manufactured by Elite or equal as manufactured by one of the manufacturers specified above, designed to function with the gate size and weight required for this project.
   1. Provide key pad access for opening function as per operation specified herein.
   2. Provide actuator loop under pavement for closing function
      a. Self-tuning sensor system for magnetically reading presence of approaching vehicle.
      b. Provide in weatherproof enclosure for exterior mounting.
      c. Provide loop detectors and all required PVC conduit.
      d. Provide push botton keypad (location as directed by Architect and Resident Engineer)
      e. Remote wireless capability (RINEAR DELTA 3) receiver.
      f. Provide timer (self close capability via delay timer).

2.03 ROLLING GATE OPERATOR EQUIPMENT

A. Operator: Model SL3000UL1HP as manufactured by Elite or equal as manufactured by one of the manufacturers specified above, designed to function with the gate size and weight required for this project.
   1. Provide key pad access for opening function as per operation specified herein.
   2. Provide actuator loop under pavement for closing function
      a. Self-tuning sensor system for magnetically reading presence of approaching vehicle.
      b. Provide in weatherproof enclosure for exterior mounting.
      c. Provide loop detectors and all required PVC conduit.
      d. Provide push botton keypad (location as directed by Architect and Resident Engineer)
      e. Remote wireless capability (RINEAR DELTA 3) receiver.
      f. Provide timer (self close capability via delay timer).

2.04 OPERATIONAL CONTROLS

A. Gates shall be electrically operated with key pad, Knox Box key, and remote switch capability in station and using Delta III controller-receiver.

B. Self contained keypad system: MINIkey from Chamberlain

C. Knox Key Switch: Single FD Switch, Model 3502

D. Timer – Grässlin GMXdigi-20 Series (includes exterior weatherproof housing)

E. Magnetic Vehicle Detector
   1. Self-tuning sensor system for magnetically reading presence of approaching vehicle.
   2. Provide in weatherproof enclosure for exterior mounting.
   3. Provide loop detectors and all required PVC conduit.
   4. Detector shall keep gate open while vehicle is located within gate location and shall override the time delay device.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect and Resident Engineer. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

A. Gate operators and controllers: Install units at locations indicated in accordance with manufacturer's written instructions and approved Shop Drawings.
1. Provide controller equipped with Fire Department Override Access.
2. Test and adjust operators and controllers for smooth, trouble-free operation.

B. Adjust gate limit switch, clutch and brake, and test for proper operation.

3.03 CLEANING

A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

B. Construction Waste: In accordance with Section 01 74 19

END OF SECTION

SECTION 32 51 40

PORTLAND CEMENT SITE CONCRETE PAVING

PART 1 GENERAL

1.01 SUMMARY

A. The work includes the construction of the PCC pavements, jointing, finishing and steel reinforcements, as indicated on the Drawings and specified herein. All public improvements shall be constructed in accordance with the indicated Standard Drawings.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Standard Specifications:

1. Standard Specifications for Public Works Construction (2012 Edition), "Greenbook", including the latest edition of the City of San Diego Regional Standard Specifications for Public Works Construction (Whitebook) 2012 Edition.

2. California Department of Transportation U.S. Customary Standard Specifications, 2010 Edition.

B. Standard Drawings:

1. City of San Diego Standard Drawings for Public Works Construction, 2012 Edition.

2. California Department of Transportation U.S. Customary Standard Specifications, 2010 Edition.

1.03 QUALITY ASSURANCE

A. Materials and workmanship specified herein with the referenced Standard Specifications shall be in accordance with the referenced articles, sections and paragraphs of the standard except that contractual and payment provisions do not apply.

1.04 SITE INSPECTION AND LOCATION OF EXISTING ON-SITE UTILITIES:

A. Prior to all work of this Section, carefully inspect the entire site and all existing items to be demolished and removed or to be left intact, and determine an orderly sequence for the performance of this work. Exact locations and alignment of existing buried utility lines are not known. Locate all existing utility lines and determine the requirements for disconnection and capping. Locate all active utilities traversing the area of work to be retained and determine the requirements for protection. Locate all points of connection and crossings by potholes and determine exact horizontal and vertical location prior to commencing the work.

1.05 PROTECTION

A. Protection and Restoration of Surface: Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Provide erosion control to prevent water-borne soil from leaving the work area by means of straw bale dikes or sand bags. The Contractor shall be responsible to clean up any soil deposited in the public right-of-way or on adjacent property. The Contractor shall be responsible to protect storm drain catch basins with sand bags and to prevent sediment from entering the storm drain system during construction.

1.06 RELATED WORK IN OTHER SECTIONS

The following work specified in other sections applies to the work of this Section, including but not limited to:

A. Div 1 as if fully repeated here in.

B. Div 31

1.07 SAFETY DURING CONSTRUCTION

A. The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property. This requirement shall be made to apply continuously and not be limited to normal working hours. Refer to Part Three of this Section and Division 1 for additional requirements.

PART 2 PRODUCTS

2.0 1 MATERIALS

A. Forms: Comply with Section 303-5 of the Standard Specifications.

B. Aggregates: Clean, normal sand gravel aggregates conforming to Sections 200-1.4 and 200-1.5 of the Standard Specifications for Public Works Construction.

C. Form release agent: Colorless form coating compounds that will not bond with, stain, or adversely effect concrete surfaces.

D. Reinforcement: Comply with the requirements of Section 201-2 of the Standard Specifications for Public Works Construction. Unless indicated otherwise more restrictive on drawings reinforcement shall consist of:
   a. **No. 3** deformed steel bars **spaced at 24"** on center each way in **non-vehicle** areas.
   b. **No. 3** deformed steel bars **spaced at 18"** on center each way in **vehicle areas.**

E. Concrete – Site Paving
   1. Comply with Section 201 of the Standard Specifications for Public Works Construction.
   2. Concrete strength:
      a. **2500 PSI** minimum in **non-vehicle** areas unless otherwise noted more restrictive on drawings or soils report
      b. **4500 PSI** minimum in **vehicle** areas unless otherwise noted more restrictive on drawings or soils report

   3. Maximum slump: 4"unless otherwise noted more restrictive on drawings or soils report.

F. Finish shall be in accordance with Section 302-6.4 of the Standard Specifications for Public Works Construction. See **Architectural drawings for enhanced concrete finishes required on exterior paving.**

G. Joint Material
   1. Pre-molded expansion Joint Filler, 1/2" thick, depth as required by slab thickness shall comply with Section 201-3.2 of the Standard Specifications for Public Works Construction.
   2. Sealant: Per Div 7, "Sealants".

H. Concrete – Decorative (integral color): See Section 32 51 41.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

A. Comply with Sections 301-1 and 303-1.2 of the Standard Specifications for Public Works Construction.

3.02 FORM WORK

A. Comply with Section 303-5.2 of the Standard Specifications for Public Works Construction.

3.03 REINFORCEMENT

A. Locate, place and support reinforcement as specified in Section 303-1.7 of the Standard Specifications for Public Works Construction.

3.04 CONCRETE PLACEMENT

Comply with the requirements of Section 303-5.3 of the Standard Specifications for Public Works Construction for mixing and placing concrete. Heavy truck traffic shall be restricted from the pavement for at least 28 days. Light truck and automobile traffic may be allowed after 14 days.

A. Exterior Portland Cement Concrete pavement thickness shall be as indicated per drawings.

3.06 JOINTS

Construct joints in concrete pavement in accordance with Section 302-6.5 of the Standard Specifications for Public Works Construction, and as indicated.

A. Weakened Plane Joints: Weakened plane joints (tooled or sawed) shall be spaced as shown on the plan, and have a depth of ¼ slab thickness.

B. Expansion Joints: Provide 1/2" minimum pre-molded joint filler with removable plastic cap for expansion joints abutting concrete curbs, catch basins, manholes, structures, walks, building foundations and other fixed objects. Construct joints as shown in Construction Drawings.

C. All joints shall be sealed in accordance with Div 7, "Sealants".

3.07 CONCRETE FINISHING

A. Comply with Section 302-6.4 of the Standard Specifications for Public Works Construction. Pavement for **trash enclosures**, **fuel tank enclosures** and **steppers**, etc. (medium broom finish) unless otherwise noted on plans. Contractor shall place 4' x 4' mock up field sample for Architect's and Resident Engineer's review prior to ordering mix and installation.

3.08 CURING AND PROTECTION

A. Comply with Section 302-6.6 of the Standard Specifications for Public Works Construction.
B. Repair or replace defective or damaged work.

END OF SECTION

SECTION 32 51 41

DECORATIVE (INTEGRAL COLOR)
CEMENT CONCRETE PAVEMENT
(Landscape)

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. Requirements of "Contract Documents, General, and Technical Provisions" and "General Provisions," apply to work in this Section with same force and effect as though repeated in full herein.

1.2 SCOPE OF WORK

A. Furnish materials, labor, transportation, services, and equipment necessary to install Portland cement concrete paving as indicated on Drawings and as specified herein.

B. Work included in this Section:
   1. Formwork.
   2. Reinforcing steel and dowels.
   3. Architectural concrete placement.

1.3 REFERENCES

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete

B. ACI 304R - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

C. ACI 305R - Hot Weather Concreting.

D. ACI 306R - Cold Weather Concreting.

E. ACI 309R - Guide for Consolidation of Concrete.

F. ASTM A 615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

G. ASTM C 31 - Standard Specification for Making and Curing Concrete Test Specimens in the Field.

H. ASTM C 33 - Standard Specification for Concrete Aggregates.

I. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

J. ASTM C 94 - Standard Specification for Ready Mix Concrete.

K. ASTM C 150 - Standard Specification for Portland Cement.

L. ASTM C 172 - Standard Practice for Sampling Freshly Mixed Concrete.

M. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

N. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete.

O. ASTM C 1064 - Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.

P. L. M. Scofield Tech-Data Bulletin D-203 – Application of Surface Retarder (for retardant finished concrete).

1.4 SYSTEM DESCRIPTION

A. Reproduction of paving surfaces includes texture, color, and jointing.

1.5 SUBMITTALS

A. In accordance with Contract Documents, General, and Technical Provisions and General Provisions.

B. Paving Mix Designs: Provide documentation for each paving type specified on Drawings:
   1. Laboratory and Cement Test Reports: Submit six (6) copies of laboratory test reports for concrete materials and a certificate with each concrete mixer truck, stating mix design, PSI rating, slump, water and cement quantity, cement/water ratio, fine and coarse aggregate and color additives.
   2. Cement:
      a. Manufacturer and plant location.
      b. Cement type, i.e. Type I, II, III, or V.
   3. Admixtures:
      a. Manufacturer and plant location.
   4. Sand:
      a. Source and type.
   5. Aggregates:
      a. Source and type.
   6. Signed certification from a licensed structural engineer.

C. Certification that Owner's Representative's mock-up has been reviewed and that materials and processes provided, will achieve intended effects indicated on Owner's Representative's mock-up.

D. Shop drawings:
   1. Indicate paving joints and scoring for cement concrete pavement areas on copies of plan view Drawings.
   2. Notate additions/deletions/recommendations/deviations from Drawings.
   3. Submit six (6) copies at same scale of full-size Drawings

E. Submit specification data "Cut Sheets" for integral color, color hardener, release agent, plastic dowel sleeves, chemical stain, curing agents, and clear sealers.

F. Products: Submit one pound samples, clearly identified, for each component used to prepare each paving type, including but not limited to, cement, sand, aggregate, coloring pigment, release agents, and chemical stains.

1.6 QUALITY ASSURANCE

A. Pre-Bid Conference: Prior to submitting bid, attend pre-bid conference with Owner's Representative to review Owner's Representative mock-up and to review requirements and artistic effect desired.

B. Contractor Mock-Ups:

1. Contractor shall prepare 4 x 4-foot mock-ups for each paving type indicated on Drawings, prior to installation.
2. Mock-ups shall be completed to the satisfaction of the Architect and Resident Engineer, Landscape Architect, and City including aggregates, texture, color, and finishes.
3. These mock-ups will become the standard of quality by which future paving samples and work will be judged.
4. Mock-ups to remain on-site and be protected during the course of construction, as a means to compare work in progress.
5. If mock-ups are damaged or removed, Contractor shall repair/replace in-kind immediately.

C. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

D. Installer: Provide evidence to indicate successful experience in providing patterned concrete work similar to that specified herein and can demonstrate successful experience through past project documentation and references.

1. Experience: Minimum 2 years experience in the installation of patterned concrete paving.
2. Demonstration of Experience: Multiple projects which have been completed within the past 24 months utilizing similar products, scope, and complexity.
3. Supervision: Perform placement and finishing of concrete work under supervision of a person having a minimum of 2 years of experience in placement and finishing of products specified herein.
4. Submit qualifications to Owner's Representative for information purposes. Submit a resume of Project Manager and Superintendent who will be overseeing the Work.

E. Slip Resistance: Provide a finish surface slip resistance coefficient of friction equal or greater than 0.6 for flat surfaces and 0.8 for ramps, when tested in accordance with ASTM F 489.

1.7 SITE OBSERVATIONS

A. Site observations herein specified shall be made by the Landscape Architect and Resident Engineer during regular business hours. The Contractor shall be on the site at the time of each observation. The Contractor shall notify the Landscape Architect and Resident Engineer of a site observation at least three (3) business days in advance of an observation.

B. All changes and deviations to the plans and specifications shall be communicated to the Construction Manager, and shall be confirmed in writing.

C. The Contractor shall have sufficient work personnel available during normal working hours to correct deficiencies immediately upon request of the Landscape Architect and Resident Engineer. Such repair or re-work services are to be performed without interference of regular project schedule.

D. Site observations will be required for the following parts of work:

1. Pre-Construction Meeting - Immediately prior to the commencement of work of this section, the Owner's Representative, Contractor, and Landscape Architect and Resident Engineer shall meet for the approval of the materials specified, equipment, schedule of work and the method of installation.
2. Layout of concrete forms shall be reviewed and approved by the Landscape Architect and Resident Engineer prior to pouring the concrete.

1.8 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 01 60 00 - Product Requirements: Transport, handle, store, and protect.

B. Store materials in dry and protected locations and protect from damage.

C. Do not change brand of cement nor source of aggregate during course of Work.

1.9 SITE CONDITIONS

A. Do not place concrete when subbase surface temperature is less than 40 degrees F, nor when surface is wet.

1.10 COORDINATION

A. In accordance with SPECIAL SITE AND PROJECT CONDITIONS as specified in Section 01 11 – Summary of Work.

B. Ensure that irrigation sleeves, electrical conduit, food cart outlets and other utility elements are accommodated and as-built located prior to pouring concrete.

1.11 INSPECTION OF SITE

A. Verify conditions at site that affect Work of this Section, and take field measurements as required. Report major discrepancies between Drawings and field dimensions to Owner's Representative prior to commencing work.

PART 2 - PRODUCTS

2.1 FORMS

A. Form work to be #2 grade Douglas Fir, free of grooves, gouges, knots, checks, bows, and cracks.

2.2 READY MIXED CONCRETE

A. Batched, mixed and transported in accordance with ASTM C94 - "Specifications for Ready Mixed Concrete."

2.3 PORTLAND CEMENT

A. Refer to Architecture Drawings for specific paving finishes requiring different cement types, to include Type I, II, III, or II/V cements conforming to ASTM C150.

B. Use same brand of cement from single source throughout entire project for each paving type.

2.4 FINE AGGREGATE (WASHED CONCRETE SAND)

A. Clean, hard, and durable washed concrete sand, uniformly graded, conforming to ASTM C33.

B. Use same fine aggregate from single source throughout entire project.

C. Free of materials with deleterious reactivity to alkali in cement.

2.5 WATER

A. Free from deleterious materials such as oils, acids, and organic matter.

2.6 REINFORCING

A. Reinforcing Steel: Conforming to ASTM A615, clean and free of rust, dirt, grease or oils.

B. Tie Wire: 16-gauge plain cold-drawn steel conforming to ASTM A82, clean, and free of rust, dirt, grease or oils.

C. Supports for Reinforcement:

1. Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars in place.

2.7 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150 - Type II.

B. Fly Ash: ASTM C 618 - Type F. The combined weight of fly ash conforming to ASTM C 618 shall not exceed 25% of the total weight of cementitious materials.

C. Concrete Aggregate: ASTM C 33 - Class 4, and as follows. Provide aggregates from a single source:

1. Maximum aggregate size: 1-inch.
2. Uniformly graded.

D. Water: Clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or reinforcement.

2.8 ADMIXTURES

A. Provide concrete admixtures that contain not more than 1 percent chloride ions and no calcium chloride.

B. Water-Reducing Admixture: ASTM 4 94, Type A.

C. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.

D. Water-Reducing and Retarding Admixture: ASTM C 494, Type D or E.

E. Acceptable Manufacturers:
   1. Water-Reducing Admixtures:
      a. ChemMasters Corp; Chemtard.
      b. Cormix Construction Chemicals; Type A Series.
      c. Euclid Chemical Company; Eucon WR-75.
      d. Or equal.
   2. High-Range Water-Reducing Admixtures:
      a. Anti-Hydro Co. Inc.; Super P.
      b. Cormix Construction Chemicals; Cormix 2000, PSI Super.
      c. Eculid Chemical Company; Eucon 37.
      d. Or equal.
   3. Water-Reducing and Acceleration Admixtures:
      a. Conspec Marketing & Manufacturing Company; Q-Set.
      b. Cormix Construction Chemicals; Gilco Accelerator or Lub NCR.
      c. Euclid Chemical Company; Accelguard 80.
      d. Or equal.
   4. Water-Reducing and Retarding Admixtures:
      a. Cormix Construction Chemicals; Type D Series.
      b. Euclid Chemical Company; Eucon Retarder 75.
      c. W.R. Grace Company: Daratard-17.
      d. Or approved equal.
   5. Surface Retarding Admixture:
      a. L.M. Scofield Company; Lithochrome Surface Retarder.
      b. Or equal.

2.9 CURING MATERIALS

A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

Moisture-Retaining Cover: One of the following complying with ASTM C 171:
   1. Waterproof paper.
   2. Polyethylene film.
   3. White burlap-polyethylene sheeting.

B. Clear, Waterborne Membrane-Forming Curing Compounds:
   1. Provide curing materials that have a maximum volatile organic compound (VOC) rating of 350 g/l.

C. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
   1. Clear, Waterborne Membrane-Forming Curing Compounds Acceptable Manufacturers:
      a. Anti-Hydro Company; Clear Cure Water Base.
      b. The Burke Company; Spartan Cote WB.
      c. Cormix Construction Chemicals; Sealco VOC.
      d. Or equal.

2. Acceptable Evaporation Control Manufacturers:
    a. Conspec Marketing and MFG. Company; Aquafilm.
    b. Euclid Chemical Company; Eucobar.
    c. L&M Construction Chemicals; E-Con.
    d. Or equal.

2.10 RELATED MATERIALS

A. Integral Color: Integrally color concrete in colors, blending mixtures and application rates necessary to create colors, gradations, and variations to match Owner's Representative's mock-up.

B. Color Hardener: Color concrete with color hardener in colors, blending mixtures and application rates necessary to create colors, gradations, and variations to match Owner's Representative's mock-up.

C. Floor Hardener: Similar to Color Hardener buy a heavier duty color hardener used for additional wear and slip resistance.

D. Color Stain: Stain the concrete with color stain in colors and blending mixtures to match Owner's Representative's mock-up. Stain shall be of same manufacturer as color hardener.

E. Bonding Agent: Acrylic or styrene butadiene.

F. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.

G. Surface Retarder: Water-based surface retarder.

H. Miscellaneous Materials: Miscellaneous specialty materials, acids, or other materials required to achieve the specialized effects indicated by Owner's Representative's mock-up or as required by Owner's Representative.

I. Acceptable Manufacturers: Subject to compliance with requirements, products that may be incorporated in Work include, but are not limited to, the following:
    1. Integral Color (dry pigment):
        a. L.M. Scofield Company; Chromix®.
        b. Admixtures; Colorfull Integral Concrete Color.
        c. OC; Integral Color Hardener.
        d. Or equal.
    2. Integral Color (liquid pigment):
        a. Solomon Colors at www.sgs@solomoncolors.com.
        b. DavisTM Colors at www.daviscolors.com.
        c. Or equal.
    3. Color Hardener:
        a. L.M. Scofield Company; Lithochrome Color Hardener.
        b. Admixtures; Colorfull Color Hardener.
        c. Master Builders; Color Hardener.
        d. Or equal.
    4. Heavy Duty Floor Hardener:
        a. L.M. Scofield Company; Emerchrome Floor Hardener.
        b. Or equal.

5. Chemical Stain:
    a. L.M. Scofield; Lithochrome Chemstain.
    b. Or equal.
6. Releasing Agents:
    a. L.M. Scofield; Antiqueing Release.
    b. Colorful; Antiqueing Hardener.
    c. Superstone; Antiqueing Hardener.
    d. Or equal.
7. Clear Penetrating Sealer (water based):
    a. L.M. Scofield; Cementone Clear Sealer.
    b. Superstone; Clear Sealer.
    c. Lambert; Clear Sealer.
    d. Or equal.

2.11 CONCRETE

A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified under ACI 301.
    1. A field quality control testing agency will be provided by Owner's Representative.

B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:
    1. Compressive Strength at 28 days: 2,500 psi.
    2. Maximum Water-Cement Ratio at Point of Placement: 0.61.
    3. Slump Limit at Point of Placement: 5-inches.
    4. Air Entrainment Content: 2 percent.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94.
    1. Reduce mixing and delivery time when air temperature is between 85 degrees F and 90 degrees F and reduce mixing and delivery time from 1-1/2 hours to 75 minutes.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Verify that paving subgrade consists of a minimum of 4-inches of compacted washed concrete sand, passes less than 7% through a #200 sieve, and is compacted to at least 95% of the materials ASTM D 1557 maximum dry density for its full depth, or as specified in the geotechnical soils report.

B. Verify that paving subgrade extends 1-foot beyond the outside edge of paving or curbing and has a positive outfall for trapped water.

C. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

D. Remove loose material from compacted subbase surface immediately before placing concrete.

E. Provide necessary chairs or supports, and maintain position of reinforcing bars.

F. Wet surface of sand subgrade prior to placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations.

B. Install forms to allow continuous progress of Work and so that forms can remain in place at least 24 hours after placing concrete.

C. Check completed formwork and screeds for grade and alignment to following tolerances:

1. Top of Forms: Not more than 1/8-inch in 10-feet.
2. Vertical Face on Longitudinal Axis: Not more than 1/4-inch in 10-feet.

D. Clean forms after each use and coat with form release agent to ensure separation from concrete.

3.3 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover over reinforcement.

3.4 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to facilitate installation of their work.

B. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes and other utility structures until they are at the required finish elevation and alignment.

C. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.

D. Deposit and spread concrete in a continuous operation between construction joints.

E. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309 R.

1. Consolidate concrete along face of forms with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Prevent dislocating reinforcing and dowels.

F. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

G. Hot-Weather Placement: Place concrete complying with ACI 305R when hot weather conditions exist.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement 90 degrees F and below. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, or soft or dry areas.

H. Cold Weather Placement: Adhere to ACI 306R - Cold Weather Concreting for installing concrete paving during cold weather.

3.5 CONCRETE FINISHING

A. General:

1. All finishes as shown on the Architectural Drawings.
2. Paving finishes to match approved Mock-Up finishes.

B. Broom Finish:

1. Broom finish paving to match approved mock-up.
2. After surface water disappears and floated surface is sufficiently hardened, produce a transverse scored texture perpendicular to direction of traffic by drawing a broom across its surface.

C. Sandblast Finish:

1. Sandblast finish paving to match approved mock-up.
2. Perform sandblasting in as continuous an operation as possible, utilizing same work crew to maintain finish continuity.
3. Provide sandblasting to a finish as indicated on Drawings.
4. Depth of Etch: Use an abrasive sand of the required gradation and grit to expose paving surface to achieve specified etch:

   Light Sand Blast: Approximately 1/32 to 3/32-inches deep.
5. Medium Sand Blast: Approximately 1/16 to 1/8-inches deep.
6. Heavy Sand Blast: Approximately 3/32 to 5/32-inches deep.
7. Carefully blast corners and edges of paving using appropriate backup boards, in order to maintain a uniform corner or edge finish as well as prevent blast damage to adjacent surfaces and landscaping.
8. Use same nozzle, nozzle pressure and blasting technique as used to prepare initial paving mock-ups. Exercise care to provide even and consistent strokes with air nozzle to minimize pockmarking of paving surface.
9. Cleanup and remove expended sand particles, concrete dust, loose aggregate, and other work-related debris at end of each day's blasting operations.

D. Acid Finish:

1. Acid finish paving to match approved mock-up.
2. Ensure that paving surfaces receiving an acid finish are hard-troweled before final concrete set.
3. Conform acid washing procedures to CAL OSHA/MSDS standards for application and clean-up.
4. Provide for containment and/or neutralization of Muriatic acid during finishing 5procedures.
5. Wrap adjacent improvements that may be etched during operations such as metalwork, stone, plant martial, etc. with plastic sheeting.
6. Wet adjacent plant material prior to acid washing.
7. Use lime and/or water to neutralize acid during clean-up operations.
8. Match approved paving sample. It is recommended that a 2-foot x 2-foot test sample be poured from same field mix and finished as same for each finish specified. Apply acid to test sample first to determine etching level prior to etching field pour.
9. Use Muriatic acid for providing an acid finish.
10. Use an airless-type sprayer to apply acid.
11. Use a soft-bristled broom to embed acid.
12. Once acid is applied to surface of paving, immediately work into surface with broom worked in both directions.
13. Do not apply acid to more than 100 square feet of surface area before brooming and washing.
14. Use a 2,500 psi pressure washer to remove spent acid. Take precautions not to etch concrete surface more than what acid had performed.
15. Acid Finishes:
    a. Light:
        1) Light acid finish paving to match approved mock-up.
        2) After 1 day of normal cure time, apply acid at full strength to 2-foot square test pour. Clean sample and allow to dry. If surface matches approved light acid finish sample, continue acid operations on entire field pour.
        3) Thoroughly clean field pour and allow to dry.
        4) Check for “hard spots”. If present, spot-treat with full-strength acid, then clean and allow to dry.
    b. Medium:
        1) Medium acid finish paving to match approved mock-up.
        2) Obtaining a medium acid finish requires acid-etching of previously light acid-etched paving.
        3) Ensure that paving areas set to receive a medium acid finish are clean and dry before applying full-strength acid.
        4) Follow steps as outlined above for a light acid finish.
    c. Heavy:
        1) Heavy acid finish paving to match approved mock-up.
        2) Obtaining a heavy acid finish requires acid-etching of previously medium acid-etched paving.
        3) Ensure that paving areas set to receive a heavy acid finish are clean and dry before applying full-strength acid.
        4) Follow steps as outlined above for a light acid finish.

E. Steel Trowel Finish:

1. Steel trowel finish paving to match approved mock-up.
2. After surface water disappears and floated surfaces have sufficiently hardened, steel trowel then retrowel the surface to a smooth and consistent finish.
3. After concrete has set enough to provide edge troweling, retrowel edges to a smooth and uniform finish.
4. Avoid excessive troweling that may produce a “burnished” area.

F. Concrete Surface Retarders:

General: The use of a rolling tamper, jitterbug or rolling jitterbug shall be considered when producing micro etched concrete surfaces. This will enable the finisher to create a denser surface paste with no obstruction due to the appearance of coarse aggregate, allowing for a uniform sand texture.

1. Protect all curbs, borders and adjacent concrete and masonry surfaces, pavers, stones etc. that are not to receive retarder finish prior to concrete placement and retarder application using Grace “Face Off”
2. Place concrete in the manner prescribed previously. Screed or strike off the surface in two (2) directions using a wooden or metal straight edge to achieve the proper elevation in a sawing motion back and forth.
3. Allow the bleed water to evaporate the surface. It can than be floated using a wooden hand float or a bull-float preferably wooden to close the surface and surround the coarse aggregate with cement paste. Float to a uniform appearance. Follow float operations with hand trowels or Fresno steel trowels to create tight dense smooth surface. (This may require two or three passes depending upon mix design and or desired finish to be achieved)

NOTE: Do not burnish the surface or allow the micro etched surface to prematurely dry prior to the application of Top-Cast.

4. Spray Applied, film forming top surface retarder, calibrated for specific sized aggregates and finish requirements without plastic covering. Color coded to allow for ease of application and verification of grade being used as well as even and complete coverage.
   a. Acceptable Materials: “TOP-CAST“ by Grace Construction Products. Customer Service Center, 877-813-1710, www.graceconstructionproducts.com or Dennis Baugh, Product Specialist, Grace 62 Whittemore Ave. Cambridge, MA 02140, 800-354-5414 x5439
5. Spray Applied, film forming protective coating for adjacent masonry and concrete surfaces.
   b. Acceptable Materials: “FACE OFF“ by Grace Construction Products.
   c. Customer Service Center, 877-813-1710, www.graceconstructionproducts.com or Dennis Baugh, Product Specialist, Grace 62 Whittemore Ave. Cambridge, MA 02140, 800-354-5414 x5439

6. Soon after the final seat finish has been completed spray Grace “Top-Cast” surface retarder using a low-pressure sprayer with a 0.5gpm tip at a rate of 200—350 sq./ft. per gallon in a full hiding coat.

   d. Once dry Grace “Top-Cast “will yield a coating that provides intermittent rain protection. Once completely dry it can be covered to protect the surface if heavy extended rains are predicted.

7. Retarder Selection Guide

Number / Aggregate Size to Expose / Color

03 / Acid Etch Finish / Lt. Blue Violet
05 / Sand Texture Finish / Lt. Blue
15 / up to ¼"agg. / Yellow
25 / 1/8" to ¼" agg / Beige
50 / 1/8" to 3/8" agg. / Canary Green
75 / ¼"-3/8" agg. / Blue
100 / 3/8" to ½" agg. / Gray
125 / 3/8" to 5/8" agg. / Pink
150 / 3/8" to 5/8" agg. / Green
200 / 5/8" to 1" agg. / Salmon
250 / 1" to 1 ½" agg. / Lt. Orange

8. Wash surface with water rinse using stiff brooms and water hose or by high pressure washing with power equipment as early as 4- 6 hours in very hot weather or the following day up to 24 hours. Retarder removal intervals are dependent upon strength of the concrete mix, aggregate size and desired washing techniques. Earlier washing on the light etches may be necessary. Verify in accordance with the mock-up approval detailed herein.
9. Rinse water and cement matrix removal shall be in accordance with local codes and should not be allowed to be washed or flow down to arroyos, storm sewers, ponds, streams or sanitary sewers by precipitation or other surface flows.
10. Prior to completion of the project, remove wash water residue from the site to location approved by the local district.

G. Sealer:
1. Glaze N' Seal Wet Look with Grip N' Seal slip resistant additive or Penetrating Sealer with slip resistant additive (800) 486-1414.
2. Or approved equal

3.6 JOINTING

A. Construct contraction, construction, and isolation joints to match irregular edge pattern of stamping tools with faces perpendicular to surface plane of concrete.

B. Contraction Joints: Provide contraction joints as indicated on Drawings (or to not exceed 10-feet in either direction), to minimize random surface cracking and as indicated on Drawings. Construct contraction joints for a depth equal to at least one fourth of concrete thickness, as follows:
1. Hand-tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each joint edge with a radiused jointer tool.
2. Machine-Sawn Contraction Joints: Provide machine-sawn contraction joints as soon as concrete has sufficient strength to support sawing equipment.
3. Do not exceed 1/4-inch in joint width.

C. Doweled Construction Joints: Construct doweled construction joints at end termination's of paving where paving operations are stopped for more than 1/2 hour, unless paving terminates at an isolation joint and at all edges of different paving types.

1. Steel Dowels:

a. Provide steel dowels across construction joints to reduce differential movement across the joint. Utilize steel dowels based upon the following:

1) 4-inch Thick Pavement:

a) Diameter: 1/2-inch.

b) Length: 24-inches.

c) On-center Spacing: Per reinforcing schedule.

b. To assist in correct alignment of steel dowels along construction joints use Speed DowelTM plastic dowel alignment sleeves:

1) Insure that wood edge forms are true to line and grade prior to installing plastic dowel alignment sleeves.

2) Install plastic dowel sleeves on wood forms at the specified on-center dowel spacing, centered between top and bottom of wood form.

2. Do not continue tie-reinforcement through sides of strip paving.

3. Use a bond breaking agent on cured concrete edges that will be joined with fresh concrete.

4. Immediately before new concrete is placed, wet construction joint and remove standing water.

5. Tool edges of construction joints to match decorative field jointing.

D. Isolation Joints: Provide isolation joints to permit horizontal and vertical movement between slab and fixed vertical edges such as building walls, steps, columns, and other vertical restraints.

1. Provide 1/4-inch thick polyethylene foam and caulking along edges of isolation joints.

2. Joints for Non-Stamped Special Flooring: Tool to profile and dimensions detailed; fill with specified grout, tool grout to a concave profile.

3. Install isolation joint sealant as specified under Section 07900 - Joint Sealers.

3.7 CONCRETE PROTECTION AND CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 305R for hot weather and ACI 306R for cold weather protection during curing.

B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture retaining cover curing, curing compound, or a combination of following:

1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with following materials:

a. Water.

b. Continuous water fog spray.

c. Absorptive cover, water saturated, kept continuously wet.

2. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
3. Curing Compound:
    a. Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions.
    b. Recoat areas subjected to heavy rainfall within 3 hours after initial application.
    c. Maintain continuity of coating and repair damage during curing period.

3.8 FIELD QUALITY CONTROL TESTING

A. Owner's Representative will employ a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include the following:
1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
    a. Compression Test Specimens: ASTM C 31. One set of four (4) standard cylinders for each compressive strength test. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
    b. Compressive-Strength Tests: ASTM C 39. One (1) set for each day's pour of each concrete class exceeding 1/2 cu. yd. but less than 25 cu. yd., plus one (1) set for each additional 50 cu. yd. Test one (1) specimen at 7 days, test two (2) specimens at 28 days, and retain one (1) specimen in reserve for later testing.
    c. Slump: ASTM C 143. One (1) test at point of placement for each compressive strength test but not less than one (1) test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
    d. Air Contact: ASTM C 231, pressure method. One (1) test for each compressive strength test but no less than one (1) test for each day's pour of each type of air-entrained concrete.
    e. Concrete Temperature: ASTM C 1064. One (1) test performed hourly when air temperature is 40 degrees F and below and when 80 degrees F and above. One (1) test for each set of compressive strength specimens.
2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.
3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing concrete.
4. Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

B. Test results will be reported in writing to Owner's Representative, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive strength tests will contain project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in paving, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7 day and 28 day tests.

C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but not be used as the sole basis for acceptance or rejection.

D. Additional Tests: The testing agency will make additional tests of concrete when test results indicate slump, air entertainment, concrete strengths, or other requirements have not been met. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42.

3.9 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, defective, or does not meet the requirements of this Section.

B. Protect concrete from damage until Final Payment. Exclude traffic from paving for at least 28 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material until Final Payment.

3.10 CLEANUP

A. At completion of Work, remove concrete stains from adjacent work, including but not limited to dissimilar paving types, walls, columns, railing posts, light fixtures, plant materials, to satisfaction of Owner's Representative.

END OF SECTION

SECTION 32 54 00

PAVEMENT MARKINGS AND RELATED SIGNS

PART 1 GENERAL

1.01 SUMMARY

The work includes on-site paint striping and markings, red painted curb, handicap symbols, signs and other painted markings and signs as indicated on the drawings.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Standard Specifications:

1. Standard Specifications for Public Works Construction (2012 Edition), "Greenbook", including the latest edition of the City of San Diego Regional Standard Specifications for Public Works Construction (Whitebook) 2012 Edition.

2. California Department of Transportation U.S. Customary Standard Specifications, 2010 Edition.

B. Standard Drawings:

1. City of San Diego Standard Drawings for Public Works Construction, 2012 Edition.

2. California Department of Transportation U.S. Customary Standard Specifications, 2010 Edition.

1.03 SUBMITTALS

A. Certificates of Compliance
1. Paint

1.04 QUALITY ASSURANCE

A. Materials and workmanship specified herein with the referenced Standard Specifications for Public Works Construction shall be in accordance with the referenced articles, sections and paragraphs of the standard except that contractual and payment provisions do not apply.

1.05 ENVIRONMENTAL CONDITIONS

A. Striping and Legends: Apply paint to clean, dry surfaces and unless otherwise approved, only when air and pavement temperatures are above 40 degrees F for oil-based materials, 50 degrees F for water-based materials, and are less than 95 degrees F. Maintain paint temperatures within these same limits.

1.06 EQUIPMENT

A. Painting Equipment: Use a stripe-painting machine capable of producing marking and striping indicated. Provide equipment having a compressor capacity of at least 105 cubic feet and capable of operating at an air pressure of 125 psi. Provide striping machine with a pointer so the machine will hold exactly to alignment. Provide propelling vehicle with a speedometer or tachometer, and with a suitable device for determining quantity of paint in the container. Mechanically agitate paint while equipment is in operation. Clean paint container and spray nozzles on machine before starting work each day.

1.07 RELATED WORK IN OTHER SECTIONS

The following work specified in other sections applies to the work of this Section, including but not limited to:

A. Div 1 as if fully repeated here in.

1.08 SAFETY DURING CONSTRUCTION

A. The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property. This requirement shall be made to apply continuously and not be limited to normal working hours. Refer to Part Three of this Section and Division 1 for additional requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Paint: Comply with Section 210-1.4 and Table 210-1.5(A) of the Standard Specifications for Public Works Construction, Fast Dry, Color as indicated on plans or in the Standard Drawings.

PART 3 EXECUTION

3.01 PREPARATION

A. Striping: Allow new pavement surfaces to cure for at least 14 days before striping. Clean pavement surfaces immediately prior to painting with a power broom and then a power blower using compressed air. Thoroughly clean pavement surface of water, oil, grease or other objectionable matter. Do not use solvent material that will damage pavement.

B. Weather Conditions: Comply with the requirements of Section 310-1.1 of the Standard Specifications for Public Works Construction.

3.02 INSTALLATION

A. Application: Conform to the requirements of Section 310-1.2 of the Standard Specifications for Public Works Construction.

B. Colors and Configurations: Parking stall striping shall be white, 4" wide. Striping at accessible parking areas shall be blue, 4" wide.

C. Painting Various Surfaces:

1. Application: Conform to the provisions of Section 310-5.1.3 of the Standard Specifications for Public Works Construction. Apply one coat of paint at a maximum rate of 110 SF per gallon of paint. Apply to required width, with clean true edges and without sharp breaks. Repaint portion of marking and striping damaged by traffic within 24 hours after applying paint. Repaint existing markings damaged by construction. Striping shall be placed on final wearing course of asphalt concrete pavement only.

END OF SECTION

SECTION 32 62 00

CONCRETE CURBS, GUTTERS AND WALKS

PART 1 GENERAL

1.01 SUMMARY

A. The work includes all necessary labor and materials for the extent of concrete curbs, gutter and walks as shown on the drawings. All public improvements shall be constructed in accordance with the indicated Standard Drawings. Contractor shall coordinate with Landscape Architectural Plans and other Sections of Work for color and finish of concrete walks.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Standard Specifications:

1. Standard Specifications for Public Works Construction (2012 Edition), "Greenbook", including the latest edition of the City of San Diego Regional Standard Specifications for Public Works Construction (Whitebook) 2012 Edition.

B. Standard Drawings:

1. City of San Diego Standard Drawings for Public Works Construction, 2012 Edition.

1.03 SUBMITTALS

A. Furnish certified reports of each proposed mix for each type of concrete prior to delivery and installation.

1.04 SITE INSPECTION AND LOCATION OF EXISTING ON-SITE UTILITIES:

A. Prior to all work of this Section, carefully inspect the entire site and all existing items to be demolished and removed or to be left intact, and determine an orderly sequence for the performance of this work. Exact locations and alignment of existing buried utility lines are not known. Locate all existing utility lines and determine the requirements for disconnection and capping. Coordinate with the respective utility companies for termination of existing utilities that are not to be utilized as part of the proposed development. Locate all active utilities traversing the area of work to be retained and determine the requirements for protection. Locate all points of connection and crossings by potholes and determine exact horizontal and vertical location prior to commencing the work

1.05 PROTECTION

A. Protection and Restoration of Surface: Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Provide erosion control to prevent water-borne soil from leaving the work area by means of straw bale dikes or sand bags. The Contractor shall be responsible to clean up any soil deposited in the public right-of-way or on adjacent property. The Contractor shall be responsible to protect storm drain catch basins with sand bags and to prevent sediment from entering the storm drain system during construction.

1.06 RELATED WORK IN OTHER SECTIONS

The following work specified in other sections applies to the work of this Section, including but not limited to:

A. Div 1 as if fully repeated here in.

B. Div 31

1.07 SAFETY DURING CONSTRUCTION

A. The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property. This requirement shall be made to apply continuously and not be limited to normal working hours. Refer to Part Three of this Section and Division 1 for additional requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Forms: Comply with Section 303-5 of the Standard Specifications for Public Works Construction.

B. Aggregates: Comply with Sections 200-1.4 and 200-1.5 of the Standard Specifications for Public Works Construction.

C. Form release agent: Colorless form coating compounds that will not bond with, stain or adversely affect concrete surfaces.

D. Concrete

1. Comply with the Standard Specifications for Public Works Construction.
2. Concrete strength shall be: **2500 psi** minimum in **non-vehicle** areas unless otherwise noted more restrictive on drawings or soils report. Reinforced per site concrete pavement specification found in separate section of this Technical Specifications.

3. Maximum Slump: 4" otherwise noted more restrictive on drawings

E. Finish in accordance with Section 303-5.5 of the Standard Specifications for Public Works Construction and as indicated.

F. Joint Material:

1. Pre-molded Expansion Joint Filler: 1/2" thick of pre-molded, resilient, non-bituminous material, in compliance with Section 201- 3.2 of the Standard Specifications for Public Works Construction.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

A. Comply with Sections 301-1 and 303-1.2 of the Standard Specifications for Public Works Construction.

3.02 FORM WORK

A. Comply with Section 303-5.2 of the Standard Specifications for Public Works Construction.

3.03 CONCRETE PLACEMENT

A. Comply with the requirements of Section 303-5.3 of the Standard Specifications for Public Works Construction.

3.04 JOINTS

Locate joints in sidewalk in accordance with Standard Drawings G-9 and G-10. Locate joints in flatwork areas to match existing adjacent work unless otherwise indicated on the Drawings.

A. General: Construct expansion, weakened-plane (contraction), and construction joints at right angles to the center line, unless otherwise shown, and in accordance with Section 303-5.4 of the Standard Specifications for Public Works Construction.

B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas not to exceed 200 SF or twice the pavement width - whichever is least. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness. Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer. Tooled joints shall be as indicated on the Drawings.

C. Construction Joints: Place construction joints at the end of all pours and at location where placement operations are stopped for a period of more than 1/2 hour, except where such pours terminate at expansion joints. Unless indicated otherwise construct joints as full depth butt type joint.

D. Expansion Joints: Provide pre-molded joint filler with removable plastic cap for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structure, walks and other fixed objects. Locate in slab where indicated, filled to full depth with expansion joint material, in curbs. Locate only 1/2" below top of concrete and seal exposed joints with joint sealer.

3.05 CONCRETE FINISHING

A. Comply with Section 303-5.5 of the Standard Specification for Public Works Construction.

B. Broomed finish: Provide a **medium** broom finish for **sidewalks** and **ramps**, unless otherwise indicated on drawings**.** Provide a **light** broom finish for **curbs** and **gutters**. unless otherwise indicated on drawings. Contractor shall place 4' x 4' mock up field sample for Architect's and Resident Engineer's review prior to ordering mix and installation.

3.06 CURING PROTECTION

A. Comply with the requirements of Section 303-5.6 of the Standard Specifications for Public Works Construction.

B. Repair defective or damaged work in accordance with Section 303-5.7 of the Standard Specifications for Public Works Construction.

END OF SECTION

SECTION 32 66 00

EXTERIOR WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. The work includes the installation of 2", 4" and 6" fire services, a 2" irrigation service and a 2" domestic water supply. All work associated with the domestic and irrigation services within the right-of-way will be performed by city forces. Contractor to extend services to building or landscape as indicated after the meter. Contractor to excavate, set tapping sleeves/saddles, corporation stops/tapping valve for fire service wet taps; City forces will make wet taps. This Section also includes trench pavement repair for areas crossing existing pavement, as specified in Section 31 22 50, "Excavating, Backfilling and Compacting for Utilities".

B. The Owner will pay water capacity, wet tap, and installation fees. The Contractor shall make all arrangements to schedule city water utility forces to install services, make wet taps and set meters.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Standard Specifications:

1. Standard Specifications for Public Works Construction (2012 Edition), "Greenbook", including the latest edition of the City of San Diego Regional Standard Specifications for Public Works Construction (Whitebook) 2012 Edition.

B. Standard Drawings:

1. City of San Diego Standard Drawings for Public Works Construction, 2012 Edition.

C. Geotechnical Report: A Geotechnical Report has been prepared for this project **(Geotechnical Exploration Report Project No. 107275001 dated March 23, 2012 and Subgrade Prep. & Base Course for Permeable Pavers dated November 6th, 2012 by Ninyo Moore)** See documents for minimum soil prep and recompaction.

D. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 42	(1993) Seamless Copper Pipe, Standard Sizes
ASTM D1785 and 120	(1994) Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80
ASTM D2466 Schedule 40	(1994; Rev. A) Poly Vinyl Chloride (PVC) Plastic Pipe Fittings,

ASTM D2564 (1993) Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Piping Systems

ASTM D2774 (1994) Underground Installation of Thermoplastic Pressure Piping

ASTM D2855 (1993) Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings

ASTM F402 (1993) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

E. AMERICAN WATER WORKS ASSOCIATION

AWWA C 900 (1989; Addendum 1992) Poly Vinyl Chloride (PVC) Pressure Pipe, 4 inches through 12 inches for Water Distribution

AWWA C 509 (1994) Resilient seated Gate Valve, 3 inches through 12 inches NPS, for Water

AWWA C 800 (1989) Underground Service Line Valves and Fittings

AWWA M 23 (1980) PVC Pipe Design and Installation

F. UNDERGROUND LABORATORIES, INC. (UL)

UL 262 (1994) Gate Valves for Fire Protection Service

UL 312 (1993; R 1994) Check Valves for Fire Protection Service

UL 789 (1993; R 1994) Indicator Posts For Fire Protection Service

G. UNI BELL PLASTIC PIPE ASSOCIATION (UBPPA)

UBPPA UNI B 8 (1986) Direct Tapping of Polyvinyl Chloride (PVC) Pressure Water Pipe

H. City of San Diego Water Utilities Department Approved Materials List, Latest Edition

1.03 SUBMITTALS

A. Manufacturer's Catalog Data

1. Pipe and Fittings

2. Joints and Couplings

3. Valves, including above ground double check detector, post indicator valve and gate valves, reduced pressure Principle Detector Assembly.

4. Valve and Meter Boxes

5. Submit manufacturer's standard drawings or catalog cuts.

B. Certificates of Compliance

1. Pipe and Fittings

2. Pipe Joint Materials

3. Valves

4. Reduced pressure Principle Detector Assembly.

C. Certificates shall attest that products meet the requirements of Water Utilities Department, City of San Diego, and that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the intervals or frequency specified in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

1.04 DELIVERY

A. Delivery and Storage: Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store plastic piping and jointing materials under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

B. Handling: Handle pipe, fittings, valves, hydrants, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Carry, do not drag pipe to the trench. Store plastic piping, jointing materials that are not to be installed immediately, under cover out of direct sunlight.

1.05 SITE INSPECTION AND LOCATION OF EXISTING ON SITE UTILITIES:

A. Prior to all work of this Section, carefully inspect the entire site and all existing items to be demolished and removed or to be left intact and determine an orderly sequence for the performance of this work. Exact locations and alignment of existing buried utility lines are not known. Locate all existing utility lines and determine the requirements for disconnection and capping. Locate all active utilities traversing the area of work to be retained and determine the requirements for protection. Locate all points of connection and crossings by potholes and determine exact horizontal and vertical location prior to commencing the work.

1.06 PROTECTION

A. The Contractor shall notify Dig Alert at 1 800 422-4133 at least two days prior to starting work and shall coordinate all work with utility company representatives. The existence and locations of existing underground facilities shown on the drawings were obtained from a search of available records. The Contractor shall take precautionary measures to protect any existing facility shown on the drawings, and any other which is not of record or not shown on the drawings.

B. For all work related to water utilities, the Contractor shall coordinate all work with Water Utilities Department, City of San Diego.

C. Shoring: The California Division Occupational Safety and Health Enforces the requirement that building and construction contractors obtain a permit prior to commencing certain types of hazardous activity, as specified in Section 65000 of the State Labor Code and Section 341 of Title 8 of the California Code of Regulations. These activities include construction of trenches or excavations which are 5' or deeper and into which a person is required to descend, the construction or demolition of any building, structure, falsework, or scaffolding more than three stories high or the equivalent height, and the underground use of diesel engines in work in mines and tunnels. Construction permits are issued by district offices of the division. The San Diego office is located at:

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
7807 Convoy Court, Suite 140
San Diego, CA 92111
(619) 637 5534

1. This project includes trenching in excess of 5' in depth which will require a permit from the California Division of Occupational Safety and Health (CAL OSHA). The Contractor shall be responsible for obtaining the appropriate permit, and shall comply with the requirements of the permit, and with CAL OSHA law.

2. The Contractor shall submit a shoring plan prepared in accordance with CAL-OSHA requirements, to the Owner's Representative for review prior to commencing the work

D. Dewatering: Provide for the disposal of surface and subsurface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include the rerouting of any storm water runoff or natural drainage, if necessary, and shall comply with requirements of the City of San Diego, County of San Diego and the California State Water Resource Board.

E. Protection and Restoration of Surface: Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Provide erosion control to prevent water borne soil from leaving the work area by means of straw bale dikes or sand bags. The Contractor shall be responsible to clean up any soil deposited in the public right of-way or on adjacent property. The Contractor shall be responsible to protect storm drain catch basins with sand bags and to prevent sediment from entering the storm drain system during construction.

1.07 RELATED WORK IN OTHER SECTIONS

The following work specified in other sections applies to the work of this Section, including but not limited to:

A. Section 31 22 50 – Excavating, backfilling & Compacting for Utilities.

B. Section 31 20 00 – Earthwork for Structures and Pavements.

C. Division 1.

1.08 SAFETY DURING CONSTRUCTION

A. The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property. This requirement shall be made to apply continuously and not be limited to normal working hours. Refer to Part Three of this Section and Division 1 for additional requirements.

PART 2 PRODUCTS

2.01 FIRE SERVICE LINE MATERIALS

A. Piping Materials and Appurtenances shall comply with the requirements of the Water Utilities Department, City of San Diego Standards.

1. PVC Piping shall be Class 200 (DR14).

B. Valves

1. Comply with the requirements of the Water Utilities Department, City of San Diego Approved Materials List and with the requirements of the Water Utilities Department, City of San Diego Standards.

2.02 WATER SERVICE LINES

A. Water service laterals shall comply with the requirements of the Water Utilities Department, City of San Diego Standards.

1. The water lateral from the water meter to the building shall be copper pipe. Pipe shall conform to ASTM B 42.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPELINES

A. Prior to commencing the work, the Contractor shall POTHOLE EXISTING UTILITIES at points of connection and all utility crossings to determine exact location.

B. Pipe Anchorage: Provide concrete thrust-blocks for 6-inch fire service line in accordance with Standard Drawings W 17 and W 18.

C. Earthwork and Buried Warning Tape: Perform earthwork operations in accordance with Section 31 22 50, "Excavating, Backfilling and Compacting for Utilities", including installation of buried warning tape.

D. Disinfection: Disinfect water lines and affected portions of existing potable water lines in accordance with AWWA C651. Apply chlorine by the continuous feed method.

3.02 FIELD QUALITY CONTROL

A. Field Tests and Inspections: The Contractor shall perform pipeline testing in accordance with Section 306 1.4 of the Standard Specifications for Public Works Construction. The Contractor shall also comply with the requirements of the Water Utilities Department, City of San Diego for testing and inspection. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications.

B. Testing Procedure: Test water mains and water service lines in accordance with the applicable specified standard. Test PVC plastic water service lines made with PVC plastic water main pipe in accordance with the requirements of UNI B3 for pressure and leakage tests. Test water service lines in accordance with applicable requirements of AWWA C600 for hydrostatic testing. No leakage will be allowed at pipe joints.

C. Special Testing Requirements: For pressure test, use a hydrostatic pressure 50 psi greater than the maximum working pressure of the system, except that for those portions of the system having pipe size larger than 2 inches in diameter, hydrostatic test pressure shall be not less than 200 psi. Hold this pressure not less than 2 hours. Prior to the pressure test, fill that portion of the pipeline being tested with water for a soaking period of not less than 24 hours. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

END OF SECTION

SECTION 32 72 00

STORM DRAINAGE SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. The work includes construction of drainage structures, filter inserts, and the installation of all storm drain lines and appurtenances as indicated on the drawings. This Section also includes trench pavement repair for areas crossing existing pavement, as specified in Section 31 22 50, "Excavating, Backfilling and Compacting for Utilities".

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Standard Specifications:

1. Standard Specifications for Public Works Construction (2012 Edition), "Greenbook", including the latest edition of the City of San Diego Regional Standard Specifications for Public Works Construction (Whitebook) 2012 Edition.

B. Standard Drawings:

1. City of San Diego Standard Drawings for Public Works Construction, 2012 Edition.

C. Geotechnical Report: A Geotechnical Report has been prepared for this project **(Geotechnical Exploration Report Project No. 107275001 dated March 23, 2012 and Subgrade Prep. & Base Course for Permeable Pavers dated November 6th, 2012 by Ninyo Moore)** See documents for minimum soil prep and recompaction.

1.03 SUBMITTALS

A. Certificates of Compliance: Submit certificates attesting that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the frequency of intervals specified in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade and size of material as is being provided for the project.

1. Pipe and Fittings

2. Catch Basins and Cleanouts

3. Frames, Grates and Covers

1.04 DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage

1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Keep inside of pipes and fittings free of dirt and debris.

2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

B. Handling: Handle pipe, fittings, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Carry, do not drag pipe to trench.

1.05 SITE INSPECTION AND LOCATION OF EXISTING ON SITE UTILITIES:

A. Prior to all work of this Section, carefully inspect the entire site and all existing items to be demolished and removed or to be left intact, and determine an orderly sequence for the performance of this work exact locations and alignment of existing buried utility lines are not known. Locate all existing utility lines and determine the requirements for disconnection and capping. Locate all active utilities traversing the area of work to be retained and determine the requirements for protection. Locate all points of connection and crossings by potholes and determine exact horizontal and vertical location prior to commencing the work

1.06 PROTECTION

A. The Contractor shall notify Dig Alert at 1 800 227-2600 at least two days prior to starting work and shall coordinate all work with utility company representatives. The existence and locations of existing underground facilities shown on the drawings were obtained from a search of available records. The Contractor shall take precautionary measures to protect any existing facility shown on the drawings, and any other which is not of record or not shown on the drawings.

B. For all work related to water utilities, the Contractor shall coordinate all work with Water Utilities Department, City of San Diego.

C. Shoring: The California Division Occupational Safety and Health Enforces the requirement that building and construction contractors obtain a permit prior to commencing certain types of hazardous activity, as specified in Section 65000 of the State Labor Code and Section 34 1 of Title 8 of the California Code of Regulations. These activities include construction of trenches or excavations which are 5' or deeper and into which a person is required to descend, the construction or demolition of any building, structure, falseworks or scaffolding more than three stories high or the equivalent height, and the underground use of diesel engines in work in mines and tunnels. Construction permits are issued by district offices of the division. The San Diego office is located at:

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
7807 Convoy Court, Suite 140
San Diego, CA 92111
(619) 637 5534

1. This project includes trenching in excess of 5 feet in depth which will require a permit from the California Division of Occupational Safety and Health (CAL OSHA). The Contractor shall be responsible for obtaining the appropriate permit and shall comply with the requirements of the permit, and with CAL OSHA law.

2. The Contractor shall submit a shoring plan prepared in accordance with CAL-OSHA requirements, to the Owner's Representative for review prior to commencing the work.

D. Dewatering: Provide for the disposal of surface and subsurface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include the rerouting of any storm water runoff or natural drainage, if necessary, and shall comply with requirements of the City of San Diego, County of San Diego and the California State Water Resource Board.

E. Protection and Restoration of Surface: Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Provide erosion control to prevent water borne soil from leaving the work area by means of straw bale dikes or sand bags. The Contractor shall be responsible to clean up any soil deposited in the public right of-way or on adjacent property. The Contractor shall be responsible to protect storm drain catch basins with sand bags and to prevent sediment from entering the storm drain system during construction.

1.07 RELATED WORK IN OTHER SECTIONS

The following work specified in other sections applies to the work of this Section, including but not limited to:

A. Section 31 22 50 - "Excavation, Backfilling and Compaction for Utilities".

B. Division 1.

1.08 SAFETY DURING CONSTRUCTION

A. The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property. This requirement shall be made to apply continuously and not be limited to normal working hours. Refer to Part Three of this Section and Division 1 for additional requirements.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Pipe and fittings: Provide one of the following, however, any pipe over 18 inch in diameter shall be RCP

1. Polyvinyl Chloride Pipe (PVC): PVC pipe and fittings shall conform to the requirements of Section 207 17 of the Standard Specifications for Public Works Construction.

2. Corrugated Plastic Piping (HDPE): HDPE pipe and fittings shall conform to the requirements of Section 207 18 of the Standard Specifications for Public Works Construction.

3. RCP pipe shall conform to the requirements of Section 207-2 of the Standard Specifications for Public Works Construction.

2.02 PRE CAST CATCH BASINS

A. Pre cast catch basins shall be as indicated and capable of supporting H20 loading.

B. Catch basin gratings shall be traffic rated for H20 loading, galvanized and shall conform to ADA requirements.

2.03 CLEANOUT

A. Cleanout shall be in accordance with Civil Drawings.

2.04 BURIED WARNING AND IDENTIFICATION TAPE

A. Shall conform to the requirements of paragraph 2.02, Section 31 22 50 "Excavation, Backfilling and Compacting for Utilities", of these specifications.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

A. Prior to commencing the work the Contractor shall POTHOLE EXISTING UTILITIES at points of connection and all utility crossings to determine exact location.

B. General Requirements for Installation of Pipelines. These requirements shall apply to pipeline installation.

1. Earthwork: Perform earthwork operations in accordance with Section "Excavation, Backfilling and Compacting for Utilities".

2. Pipe Laying and Jointing: Conform to the provisions of Section 306 1.2 of the Standard Specifications for Public Works Construction.

3. Installation of Buried Warning Tape: Install buried warning tape in accordance with the requirements of Section, "Excavation, Backfilling and Compacting for Utilities", of these specifications.

3.02 INSTALLATION OF PRECAST DRAINAGE CATCHBASIN AND CLEANOUT

A. Install pre cast drainage catch basins in locations indicated. Provide 6-inch thick concrete floor if not integral with box or as directed by the Civil Drawings.

3.03 METAL WORK

A. Workmanship and Finish: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron and steel to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and fee from warp, cold shuts, and blowholes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well defined lines and arises. Provide rabbits, lugs, and brackets wherever necessary for fitting and support.

3.04 FIELD QUALITY CONTROL

A. Field Tests and Inspections: The Contractor shall be able to produce evidence, when required, that each item of work has been constructed properly in accordance with the drawings and specifications.

END OF SECTION

SECTION 32 73 00

EXTERIOR SANITARY SEWER SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. The work includes the installation of sewer laterals and appurtenances as indicated on the drawings to connect to the existing sewer indicated.

1.02 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. Standard Specifications:

1. Standard Specifications for Public Works Construction (2012 Edition), "Greenbook", including the latest edition of the City of San Diego Regional Standard Specifications for Public Works Construction (Whitebook) 2012 Edition.

B. Standard Drawings:

1. City of San Diego Standard Drawings for Public Works Construction, 2012 Edition.

C. UNI BELL PLASTIC PIPE ASSOCIATION (UNI)

UNI B5 (1982) Installation of Polyvinyl Chloride (PVC) Sewer Pipe

UNI B6 (1990) Low Pressure Air Testing of Installed Sewer Pipe

1.03 DESCRIPTION

A. Sanitary Sewer Gravity Pipeline: The system consists of polyvinyl chloride (PVC) plastic pipe, cleanout, and connections to existing manhole.

1.04 SUBMITTALS

A. Certificates of Compliance

1. Pipe and Fittings

2. Pipe Joint Materials

3. Frames and Covers

B. Certificates shall attest that tests set forth in each applicable referenced publications have been performed, whether specified in that publication to be mandatory or otherwise. Production control tests shall have been performed at the intervals or frequency specified in the referenced publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage

1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping, jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

B. Handling: Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Carry do not drag, pipe to trench.

1.06 PROTECTION

A. The Contractor shall notify Dig Alert at 1 800 422-4133 at least two days prior to starting work and shall coordinate all work with utility company representatives. The existence and locations of existing underground facilities shown on the drawings were obtained from a search of available records. The Contractor shall take precautionary measures to protect any existing facility shown on the drawings, and any other which is not of record or not shown on the drawings.

B. For all work related to water utilities, the Contractor shall coordinate all work with Water Utilities Department, City of San Diego.

C. Shoring: The California Division Occupational Safety and Health Enforces the requirement that building and construction contractors obtain a permit prior to commencing certain types of hazardous activity, as specified in Section 65000 of the State Labor Code and Section 34 1 of Title 8 of the California Code of Regulations. These activities include construction of trenches or excavations which are 5' or deeper and into which a person is required to descend, the construction or demolition of any building, structure, falseworks or scaffolding more than three stories high or the equivalent height, and the underground use of diesel engines in work in mines and tunnels. Construction permits are issued by district offices of the division. The San Diego office is located at:

State of California
Department of Industrial Relations
Division of Occupational Safety and Health
7807 Convoy Court, Suite 140
San Diego, CA 92111
(619) 637 5534

1. This project includes trenching in excess of 5 feet in depth which will require a permit from the California Division of Occupational Safety and Health (CAL OSHA), The Contractor shall be responsible for obtaining the appropriate permit and shall comply with the requirements of the permit, and with CAL OSHA law.

2. The Contractor shall submit a shoring plan prepared in accordance with CAL-OSHA requirements, to the Owner's Representative for review prior to commencing the work.

D. Dewatering: Provide for the disposal of surface and subsurface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include the rerouting of any storm water runoff or natural drainage, if necessary, and shall comply with requirements of the City of San Diego / County of San Diego and the California State Water Resource Board.

E. Protection and Restoration of Surface: Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Provide erosion control to prevent water borne soil from leaving the work area by means of straw bale dikes or sand bags. The Contractor shall be responsible to clean up any soil deposited in the public right of-way or on adjacent property. The Contractor shall be responsible to protect storm drain catch basins with sand bags and to prevent sediment from entering the storm drain system during construction.

1.07 RELATED WORK IN OTHER SECTIONS

The following work specified in other sections applies to the work of this Section, including but not limited to:

A. 31 22 50, "Excavation, Backfilling and Compaction for Utilities".

B. Division 1.

1.08 SAFETY DURING CONSTRUCTION

The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property. This requirement shall be made to apply continuously and not be limited to normal working hours. Refer to Part Three of this Section and Division 1 for additional requirements.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. PVC Plastic Gravity Sewer Piping

1. PVC Plastic Gravity Pipe and Fittings: Conform to the provisions of Section 207-17 of the Standard Specifications for Public Works Construction and the City of San Diego Supplements.

2. PVC Plastic Gravity Joints and Jointing Material: Conform to the provisions of Section 207-17 of the Standard Specifications for Public Works Construction and the City of San Diego Supplements.

2.02 CLEANOUT

A. Provide in accordance with Standard Drawings SDS-102/103.

2.03 SEWER LATERAL

A. Provide in accordance with Standard Drawing SDS-105.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

A. The Contractor shall notify DIG ALERT at 1 800 422-4133 at least two (2) days prior to starting work and shall coordinate all work with utility company representatives. The existence and locations of existing underground facilities shown on the plans were obtained from a search of available records. The Contractor shall take precautionary measures to protect any existing facility shown on the plans, and any other which is not of record or not shown on the plans.

1. The Contractor shall coordinate all work with the City of San Diego, Field Engineering Division, Engineering and Capital Projects Department Resident Engineer prior to excavating. Additional utilities may exist on site which are not of record, not indicated on the plans, or not located by "DIGALERT". The Contractor shall make every effort to locate and protect possible underground utilities prior to excavating.

2. The Contractor shall take precautionary measures to avoid overhead power lines.

B. Install sanitary pipelines and appurtenances in conformance with the provisions of Section 306-1.2 of the Standard Specifications for Public Works Construction, and the following requirements:

1. Location: The work covered by this section shall terminate at a point approximately 5 feet from the building, or as indicated. Where the location of the sewer is not clearly defined by dimensions on the drawings, do not lay sewer line closer horizontally than 10 feet to a water main or service line. Where sanitary sewer lines pass below water lines, lay pipe so that no joint in the sewer line will be closer than 3 feet, horizontal distance, to the water line.

2. Earthwork and Buried Warning Tape: Perform earthwork operations in accordance with Section, "Excavating, Backfilling and Compacting for Utilities", including installation of buried warning tape.

3. Pipe Laying and Jointing: Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay non pressure pipe with the bell or groove ends in the upgrade direction. Adjust spigots in bells and tongues in grooves to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each workday, close open ends of pipe temporarily with wood blocks or bulkheads. Provide batterboards not more than 25' apart in trenches for checking and ensuring that pipe invert elevations are as indicated.

C Laser beam method may be used in lieu of batterboards for the same purpose.

3.02 FIELD QUALITY CONTROL

A. Field Tests and Inspections: The Contractor shall be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

B. Tests for Nonpressure Lines

1. Leakage Tests: Perform tests in accordance with Section 306-1.4 of the Standard Specifications.

END OF SECTION

SECTION 32 80 00

IRRIGATION SYSTEM

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 SCOPE OF WORK

A. The work includes all labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery, and installation of a complete functioning "irrigation system," complete as shown on the Drawings and as specified herein.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer with a minimum of 2 years of professional experience whose work has resulted in successful establishment of irrigation systems.

1. Installer's Field Supervision: Require Installer to maintain an experienced and qualified full-time supervisor on project site when irrigation system installation is in progress.

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

C. It is the intention of this specification to accomplish the work of installing an automatic irrigation system, which will operate in an efficient and satisfactory manner according to professional standards established for landscape installation and sprinkler irrigation operation as set forth by the California Landscape Contractors Association (CLCA). The specification can only indicate the intent of the work to be performed rather than a detailed description of the performance of the work. It shall be the responsibility of the Contractor to install said materials and equipment in such a manner that they shall operate efficiently and evenly and support optimum plant growth and health.

D. In the event of any discrepancies between the Drawings and the Specifications, the Contractor shall notify the Landscape Architect and Resident Engineer immediately.

E. It shall be distinctly understood that no oral statement of any person shall be allowed in any manner to modify any of the contract provisions. Changes shall be made only on written authorization of the Owner - except in an emergency endangering life or property.

F. Make use of all data in all of the contract documents including manufacturer's information and verify the information on site prior to bidding on this work and also at the time of installation.

1.4 INTENT OF CONSTRUCTION DRAWINGS

A. Irrigation piping and related equipment are drawn diagrammatically. Scaled dimensions are approximate only. Before proceeding with work, carefully check and verify dimensions and immediately notify the Owner's Representative and the Landscape Architect and Resident Engineer of discrepancies between the Drawings or Specifications and the actual conditions. Although sizes and locations of plants and of irrigation equipment are drawn to scale wherever possible, it is not within the scope of the Drawings to show all necessary offsets, obstructions, or site conditions. The Contractor shall be responsible to install his or her work in such a manner that it will be in conformance to site conditions, complete, and in good working order.

B. Piping and equipment is to be located within the designated planting areas wherever possible unless specifically defined or dimensioned otherwise.

1.5 SUBMITTALS AND SUBSTITUTIONS

A. Prior to installation of any irrigation work, the Contractor shall submit for approval by the Landscape Architect and Resident Engineer, a list of all materials and equipment proposed for use. Submit product data for each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. The following product data, not all inclusive, shall be submitted to the Landscape Architect and Resident Engineer:

1. Automatic controller assembly (including controller, controller cabinet, etc.).
2. Master control valve.
3. Flow sensor and data interface.
4. Main line pipe, lateral line pipe, pipe sleeves.
5. Solvent cement.
6. Isolation valves (gate valves, ball valves, etc).
7. Remote control valve.
8. Quick coupler valve.
9. Valve boxes.
10. Control wire.
11. Flush valves.
12. Waterproof wire connectors.
13. Sprinkler heads (for each type).
14. Paint products.
15. Drip valve assembly.
16. Dripperline, dripperline fittings, and integral dripperline components (for each type).

B. Prior to beginning construction, submit a list of irrigation equipment to be used accompanied by manufacturer's catalog data, specifications, or other literature clearly indicating compliance with specification requirements for each item.

C. Qualification Data: For qualified Installer.

D. Controller Zoning Charts.

E. Field quality-control reports.

F. Operation and Maintenance Data: For drip irrigation components, sprinklers, automatic controllers, flow sensors, and valves to include in operation and maintenance manuals.

G. Manufacturer's Field Service (post-installation): Submit written documentation to the Landscape Architect and Resident Engineer from the factory-authorized service representatives that systems are fully functional and installed correctly.

H. Substitutions will be permitted only with the Landscape Architect's and Resident Engineer's approval. Where such substitution will change the coverage or flow rates of the sprinkler heads and associated hydrozone, the request for substitution shall include layout plans showing revised sprinkler head locations. Such revised layout plans shall provide coverages and water flow rates equivalent to those indicated. Samples of equipment may be required at the request of the Landscape Architect and Resident Engineer if the equipment is other than that specified.

I. Equipment or materials installed or furnished without prior approval of the Landscape Architect and Resident Engineer may be rejected by the Landscape Architect and Resident Engineer, and the Contractor shall remove such materials from the site at his or her own expense.

J. Approval of substitution of material and/or products, other than those specified, shall not relieve the Contractor from complying with the requirements of the Contract Documents and Specifications. The Contractor shall be responsible at his or her own expense for all changes by approved substitutions, which affect other items of his or her own work and/or the work of other contractors.

1.6 GUARANTEE

A. Contractor guarantees all equipment, materials, and labor furnished or performed under the contract (unless furnished by the Owner) against defects in design, materials, and workmanship for a period of one (1) year, unless otherwise specified, from the date of final acceptance of work.

B. Neither the final certificate for payment nor any provision in the contract documents shall relieve the Contractor of responsibility for faulty materials or workmanship, and he or she shall remedy any defects due thereto and pay for any damage to other work resulting there which may appear within a period of one (1) year from the date of final acceptance of work.

1.7 EXAMINATION OF SITE

A. The Contractor shall be held to have examined the project site and to have compared it with the Drawings and Specifications, to have carefully examined all of the contract documents and to have satisfied himself or herself as to the conditions under which the work is to be performed before entering into his or her contract for this work. No allowance shall subsequently be made on behalf of the Contractor on account of an error on his or her part or his or her negligence or failure to acquaint himself or herself with the conditions of the site, existing utility locations and easements, or of the streets or roads approaching the site. Submit any questions in writing prior to commencement of job.

1.8 PROTECTION OF WORK AND PROPERTY

A. All materials and equipment shall be stored properly and protected as required by the Contractor. The Contractor shall be entirely responsible for damages or loss by weather or other cause to work under the contract. Materials shall be furnished in ample quantities and at such times as to ensure uninterrupted progress of the work.

B. The Contractor shall continuously maintain adequate protection of all his or her work from damage, destruction, or loss, and shall protect the Owner's property from damage arising in connection with this contract. Contractor shall make good any such damage, destruction, loss or injury. Contractor shall adequately protect adjacent property as provided by law and the contract documents.

C. Prior to excavation for irrigation piping or equipment, Contractor shall locate underground utilities and related systems, and take proper precautions to avoid damage to such improvements. In the event of a conflict between such utilities, related systems, lines, irrigation piping, and/or equipment locations, Contractor shall notify the Owner's Representative and arrangements will be made for relocation as necessary. The Contractor assumes responsibility for making repairs for damages resulting from work as herein specified.

1.9 PROTECTION OF EXISTING IRRIGATION SYSTEM AND PLANT MATERIAL

A. All existing irrigation system components and plant material to remain which are within the project limits shall be temporarily tagged and identified by the Contractor prior to start of work. Paint markings or other permanent means are not permitted. Contractor shall provide the required maintenance to maintain the existing vegetation in a healthy and growing condition, including supplemental irrigation if needed, at no cost to the Owner.

B. All existing irrigation system components and plant material to remain which are within the project limits shall be tagged and identified by the Contractor prior to start of work. Contractor shall provide the required maintenance to maintain the vegetation in a healthy and growing condition, including supplemental irrigation if needed.

C. All existing irrigation system components and plant material shall be protected at all times from damage by personnel and equipment. All damages to existing irrigation system components and plant materials shall be repaired at the Contractor's expense.

D. Damage to a tree or shrub, which results in death or permanent disfiguration, shall result in the Contractor's complete removal of said tree or shrub, including roots, from the site. The Contractor shall replace the plant material as established by the Landscape Architect and Resident Engineer with one of equal value at his or her own expense or shall reimburse to the Owner the cost of said replacement. The Landscape Architect and Resident Engineer shall be the sole judge of the replacement of any plant material.

1.10 POINTS OF CONNECTION

A. The Contractor shall verify with the Owner’s Representative in the field the most appropriate location and source for the water and electrical points of connection.

B. The electrical point of connection shall be made by an appropriately licensed Electrical Contractor per governing codes.

1.11 TEMPORARY UTILITIES

A. All temporary piping, wiring, meters, panels and other related appurtenances required between source of supply and point of use shall be provided by the Contractor and coordinated with the Owner's Representative. Existing utilities may be used with the written permission of the Owner’s Representative.

B. The Contractor shall meter and pay for the furnishing of all electricity and water for his or her use unless otherwise stated. All water used for construction purposes shall be separated from the potable domestic water supply by a reduced pressure principle device (RP) backflow prevention device provided by the Contractor at their expense approved by the Landscape Architect and Resident Engineer.

1.12 CUTTING, PATCHING, TRENCHING, AND DIGGINGS

A. The Contractor shall do all cutting, fitting, trenching or patching of his or her work that may be required to make its several parts come together properly and fit them to receive or be received by work of other contractors shown upon, or reasonably implied by, the Drawings and Specifications for the completed project. Contractor shall do all that is necessary to accomplish the joining of said several parts in a neat and workman-like manner to the satisfaction of the Owner's Representative.

B. Trenching shall be performed only during the period when beneficial and optimum results may be obtained. If the moisture content of the soil should reach a level that working it would destroy the soil structure, digging and trenching operations shall be suspended until the moisture level is increased or reduced to acceptable levels and the desired results are likely to be obtained.

C. The Contractor shall not endanger any work by cutting, digging or otherwise, and shall not cut or alter the work of any other contractor without the consent of the Owner's Representative.

1.13 SPECIMEN TREES

A. All specimen trees twenty-four-inch (24") box and larger shall be installed prior to the location of the irrigation system. The layout of the irrigation system shall be adjusted to accommodate all specimen trees with the approval of the Owner's Representative.

1.14 USE OF PREMISES

A. The Contractor shall confine his or her apparatus, the storage of materials and the operations of his or her personnel to limits indicated by the law, ordinances, or permits and shall not unreasonably encumber the premises with his or her materials.

1.15 PERMITS AND REGULATIONS

A. The Contractor shall give all notices and pay all fees necessary for completion of work under this contract, and shall obtain and pay for all permits, certifications, and licenses (except permanent easements) over all or any part of the work as drawn and specified.

1.16 APPLICABLE CODES AND STANDARDS

A. Wherever references are made in the contract to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract shall apply, unless otherwise expressly set forth. Unless otherwise specified, reference to such standards or codes is solely for implementation of the technical portions of such standards and codes.

B. In case of conflict among any referenced standards or codes or between any referenced standards and codes and the Specifications, the Landscape Architect and Resident Engineer shall determine which shall govern.

1.17 DRAWINGS AND SPECIFICATIONS AT THE WORK SITE

A. The Contractor shall keep one copy of all Drawings and Specifications on the work site, in good order, available to the Landscape Architect and Resident Engineer and to his or her representatives at the project site.

1.18 AS-BUILT DRAWINGS

A. The Contractor shall be responsible for completion of “as-built” drawings, and the following procedure shall be adhered to:

1. Contractor shall maintain a redline as-built drawings set on-site at all times during construction, and shall update drawings on Friday of every week.
2. Contractor shall not request inspection of any work installed contrary to the drawings until noted on the redline as-built drawings.

B. Before the final request for payment is made and final approval obtained, pre-as-built drawings shall be completed by the Contractor. One copy set of the drawings shall be delivered to the Landscape Architect and Resident Engineer with all as-built indications and changes noted, marking out all items which are not as-built conditions. The drawings shall present the final as-built information clearly. Equipment such as valves and backflow prevention assemblies shall be referenced and dimensioned from two fixed points on the site, to triangulate their location.

C. After pre-as-built drawings have been approved by the Landscape Architect and Resident Engineer, the Contractor shall obtain, at his or her own expense, Mylar transparencies of the original drawings and transfer the as-built information onto them. Drafting shall be of equal quality to the working drawings. All as-built indications shall be made on the transparencies by an experienced draftsperson. All as-built changes shall be drafted in black India ink. All items, which have changed and are not as-built shall be bubble/cloud encircled and clearly labeled.

D. The Contractor shall sign and certify on the original as-built drawings as to the accuracy of the completed drawings. All damages due to inaccurate as-built drawings shall be repaired within twenty-four (24) hours after notification to the satisfaction of the Owner’s Representative and at no cost to the Owner.

1.19 CONTROLLER ZONING CHARTS

A. Provide one controller zoning chart for each automatic controller installed. Controller zoning chart shall be blackline print of actual as-built drawings showing the area covered by that controller and reduced to fit in the controller cabinet. Keep reduction to maximum size possible to retain full legibility.

B. Identify the area of coverage of each remote control valve, using a distinctly different pastel color, drawn over the entire piping system of the area of coverage.

C. Following approval of charts by the Landscape Architect and Resident Engineer, hermetically seal chart between two layers of 20 mil. thick plastic sheeting.

D. Controller zoning charts shall be completed and approved prior to final walk-through of irrigation system.

E. The controller zoning charts shall be affixed to the inside of the controller cabinet doors using an approved mastic or fastening system and also in the maintenance room area, if applicable.

1.20 SITE OBSERVATIONS

A. Site observations herein specified shall be made by the Landscape Architect and Resident Engineer during office working hours on each of the steps or conditions listed below. The Contractor or his or her authorized representative shall be on the site at the time of each observation. The Contractor will not be permitted to initiate the succeeding step of work until he or she has received approval to proceed by the Landscape Architect and Resident Engineer. The Contractor shall notify the Landscape Architect and Resident Engineer of a requested site observation at least three (3) business days in advance of an observation.

B. All changes and deviations to the Drawings and Specifications by the Landscape Architect and Resident Engineer to the Contractor shall be confirmed in writing.

C. The Contractor shall have sufficient work personnel available during normal working hours to correct deficiencies immediately upon request of the Landscape Architect and Resident Engineer. Such repair or re-work services are to be performed without interference of regular project schedule.

D. Site observations will be required for the following parts of the work:

1. Pre-Construction Meeting: Immediately prior to the commencement of work of this section, the Owner's Representative, Landscape Architect and Resident Engineer, and the Contractor shall meet for approval of the materials specified, equipment, schedule of work and the method of installation.
2. Trenching and Sleeving Review: Completion and installation of all trenching and sleeving.
3. Pressurized Mainline Test: Completion of installation and testing, prior to backfilling.
4. Lateral Line Test: Completion and testing, prior to backfilling.
5. Adjustment and Coverage Test: Adjust and test the operating performance of all installed irrigation systems prior to commencement of planting operations with the exception of specimen tree planting.
6. Pre-Maintenance Period Observation: Entire irrigation system shall be completely installed and operational. All discharge ends of drip emitters shall be exposed under operation for observation to demonstrate that all emitters are performing and installed as designed, prior to placing bark mulch over emitter discharge ends. This observation shall be coordinated with the pre-maintenance observation of the planting installation. A written "punch list" indicating all items to be corrected and the beginning date of the Maintenance Period will be sent to the Contractor. This is not Final Acceptance and does not relieve the Contractor from any of the responsibilities in the contract documents.
7. Final Site Observation: At the conclusion of the Maintenance Period, a final site observation will be made. The Contractor shall show evidence that the Owner's Representative has received all charts, records, as-built drawings, and extra equipment as required before Final Acceptance. The Contractor shall show all corrections made from the written "punch list" previously generated by the Landscape Architect and Resident Engineer. Any items deemed not acceptable shall be reworked and the Maintenance Period will be extended.
8. The Contractor will be notified in writing that the contract work and Maintenance Period has been accepted or that the Maintenance Period has been extended to correct any deficiencies remaining. Final Acceptance shall establish the beginning date for the Guarantee Period.

E. Site observation of the work shall not relieve the Contractor of the obligation to fulfill all conditions of the contract.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials shall be of standard, approved, and first grade quality and shall be new and in perfect condition when installed and accepted.

B. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and configuration desired only. Other manufacturer's equipment may be submitted for approval with written approval by the Landscape Architect and Resident Engineer. Only upon submittal and subsequent written approval of the material list shall these items be permitted. Changes to hydraulics brought about by the use of other equipment than that specified shall be recalculated by the Contractor and submitted to the Landscape Architect and Resident Engineer for written approval. Such work shall not be installed prior to receipt by the Contractor of the written approval.

C. Whenever such terms as "in accordance with manufacturer's specifications" is used, it shall mean in strict accordance with the manufacturer's printed directions. If those directions conflict with this specification, the matter shall be brought to the attention of the Landscape Architect and Resident Engineer for clarification prior to proceeding with work.

D. Approval of any items or substitutions indicates only that the product(s) apparently meet the requirements of the Drawings and Specifications on the basis of the information or samples submitted. The Contractor shall be responsible for the performance of substituted items. If the substitution proves to be unsatisfactory, the Contractor shall replace said items with the originally specified items, including all necessary work and modifications to replace the items, at no cost to the Owner.

2.2 PIPING MATERIAL

A. Individual types of pipe and fittings supplied are to be of compatible manufacturer unless otherwise approved. Pipe sizes shown are nominal inside diameter unless otherwise noted.

B. Steel Pipe: ASTM A 53/A 53M, Schedule 40, Type S or E, Grade A or B, galvanized with threaded ends.
   1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, galvanized, seamless steel pipe with threaded ends.
   2. Malleable-Iron Unions: ASME B 16.39, Class 150, hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface, and female threaded ends.
   3. Gray-Iron Threaded Fittings: ASME B 16.4, Class 125, galvanized, standard pattern.
   4. Cast-Iron Flanges: ASME B 16.1, Class 125.
   5. Cast-Iron Flanged Fittings: ASME B 16.1, Class 125, galvanized.

C. Brass pipe and fittings: Brass pipe shall be 85% red brass, American National Standard Institute (ANSI), Schedule 40-screwed pipe.
   1. Fittings shall be medium brass, screwed 125-pound Class.

D. Hard copper tube and fittings: Copper tube (pipe) shall be ASTM B 88, Type L, water tube, drawn temper.

1. Fittings shall be ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings for 2-1/2 inch size and smaller pipe.
2. Cast brass fittings shall be used for pipe over 2-1/2 inch size.
3. Bronze Flanges: ASME B 16.24, Class 150, with solder-joint end.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

E. Plastic pipe and fittings:

1. All pipes shall be free of blisters, internal striations, cracks, or any other defects or imperfections. The pipe shall be continuously and permanently marked with the following information: manufacturer's name or trade mark, size, class and type of pipe, pressure rating, quality control identifications, and date of extrusion.
2. Pressure mainline for piping upstream of remote control valves and quick coupling valves:
   a. 3/4" to 1-1/2" diameter pipe: Plastic pipe for use with solvent weld and/or threaded fittings. Shall be manufactured rigid virgin polyvinyl chloride PVC 1120, ASTM D 1784, conforming to ASTM D 1785, designated as Schedule 40.
3. Non-pressure lateral line for piping downstream of remote control valves shall be plastic pipe for use with solvent weld or threaded fittings, shall be manufactured rigid virgin polyvinyl chloride (PVC) 1220 (Type 1, Grade 2) conforming to ASTM D 1785, designated as Schedule 40, three-quarter-inch (3/4″) minimum size.
4. Identification: Furnish plastic pipe continuously and permanently marked with following information: Manufacturer's name or trade mark, size, class and type of pipe, working pressure at 73.4 F and National Sanitation Foundation (NSF) rating.
5. Polyethylene tubing for drip systems shall be constructed of linear, low density, polyethylene resin manufactured under ASTM Standards.
6. Fittings and connections:
   a. Fittings for 3" diameter pipe and smaller shall be plastic manufactured rigid virgin polyvinyl chloride (PVC) 1220, (Type 2, Grade 1), conforming to ASTM D 2464 or D 2466, Schedule 40, high impact molded suitable for either solvent weld or threaded connections as required.

2.3 PIPE CONNECTION MATERIALS

A. Threaded connections: Teflon tape or approved equivalent, UL listed.

B. Gasketed fittings: Lubricant per manufacturer's recommendations.

C. Solvent weld connections - primer and adhesive solvent shall be type as recommended by manufacturer of pipe and fittings:

1. All cans of solvents and primers shall have labels intact and shall be stamped with the date and manufacturer. No cans dated over two (2) years old will be permitted.
2. No thinning of solvent or primer in any manner will be permitted.

D. Nipples and risers:

1. Metallic: red brass, standard pipe size, Schedule 40, ASTM b43. Composition: nominal copper content to be 85 percent (min. 83%, max. 86%), nominal zinc content to be 15 percent. Maximum allowable lead and iron content to be 0.05 percent each.
2. Plastic: plastic nipples and risers shall be manufactured rigid virgin polyvinyl chloride PVC, (Type 1, Grade 1), conforming to ASTM D 1784 or D 2464, designated as Schedule 80 with molded threads.

2.4 AUTOMATIC CONTROLLER ASSEMBLY

A. The Automatic Controller Assembly shall be a complete pre-packaged unit consisting of an automatic controller, a stainless steel enclosure, a stainless steel pre-drilled removable backboard, a terminal interface board, an electrical junction box with a Ground Fault Circuit Interrupter (GFCI), a ground rod, a flow sensor device with all associated data interface components, and a rain shut-off switch.

B. Automatic controller shall be electric, self-contained outdoor type, wall or pedestal mounted, 120 volt, 60 cycle. Controller shall be completely automatic, and also be able to operate manually. Independent stations shall be adjustable from 2 to 60 minutes and the programming shall be capable of at least two (2) independent programs with at least three starts per day. Controller shall have a master switch, which shall be possible to operate each valve manually, independent of the clock, or any other valve.

C. Controller shall be housed in a sturdy, locking, weather-resistant, vandal-resistant stainless steel enclosure, furnished for maximum exterior protection.

D. Automatic Controller Assembly shall have a stainless steel pre-drilled removable backboard.

E. A pre-labeled, pre-wired, terminal interface board shall clearly indicate the proper points of connection for all appropriate wiring (including station valves, commons, master valves, flow sensors, pump start, other sensors, etc).

F. An electrical junction box shall be provided within the assembly with an on/off switch, and a duplex receptacle equipped with a Ground Fault Circuit Interrupter (GFCI).

G. Automatic Controller Assembly shall have a ground rod with clamp.

H. Automatic Controller Assembly shall include a flow sensor device with all associated data interface components to allow it to function properly with the master control valve and the automatic controller.

I. All power within the Automatic Controller Assembly housing shall be properly phased.

J. The entire Automatic Controller Assembly shall be Underwriters Laboratory Inc. (UL) listed.

K. The entire Automatic Controller Assembly shall have a manufacturer’s standard five (5) year warranty.

2.5 MASTER CONTROL VALVE

A. Shall be normally open, sized same as backflow prevention assembly or larger, brass or bronze body.

B. See Irrigation Schedule on Drawings for manufacturer and model type.

C. The master control valve wire shall be a two-conductor of ICEA Class B, 16 AWG, 3-strand, conforming to ASTM B-3 and B-8, aluminum shielded with drain wire, and shall have a jacket of 0.50 sunlight and moisture resistant PVC, as manufactured by Arizona Electric Fabrication, Inc. (AEF #9516-2SP), or equal.

2.6 FLOW SENSOR AND FLOW SENSOR DATA INTERFACE

A. Flow sensor, flow sensor cable, communication cable, and decoders shall be provided with Automatic Controller Assembly unit.

B. The flow sensor wire shall be a two-conductor of ICEA Class B, 14 AWG, 3-strand, conforming to ASTM B-3 and B-8, aluminum shielded with drain wire, and shall have a jacket of 0.50 sunlight and moisture resistant PVC, as manufactured by Arizona Electric Fabrication, Inc. (AEF #9516-2SP), or equal.

C. The flow sensor data interface shall be Series 800 Local Adjustable Relay Control (LARC), as manufactured by Data Industrial Corporation, as noted within the Automatic Controller Assembly model number on Drawings, or equal.

2.7 ISOLATION VALVES (GATE VALVES / BALL VALVES / GLOBE VALVES, ETC)

A. Isolation valves for three-quarter-inch (3/4”) through two-and-one-half-inch (2-1/2 size shall be Nibco #T-580 ball valves of bronze and brass construction.

B. All isolation valves located in a remote control valve manifold shall be the same size as the largest remote control valve in the manifold, one-and-one-half-inch (1-1/2”) size minimum. Provide pipe-reducing adapters downstream of valves, as required.

C. All in-line isolation valves shall be the same size as the mainline pipe.

D. See irrigation legend for manufacturer and model type.

2.8 CHECK VALVES

A. Swing check valves 2" and smaller shall be 200 lbs., W.O.G., bronze construction with replaceable composition, neoprene or rubber disc and shall meet or exceed Federal Specification WW-V- 5ld, Class A, Type IV.

B. Anti-drain valves at sprinklers shall be of heavy-duty virgin PVC construction, with soft composition neoprene disc and stainless steel internal parts. Anti-drain valves shall be field adjustable to compensate for elevational changes up to 32 feet. Anti-drain valves shall be Hunter “HCV”, or approved equal.

C. See below for dripperline in-line check valves.

2.9 REMOTE CONTROL VALVES

A. Remote control valves shall be electrically operated, single seat, normally closed configuration, equipped with flow control adjustment and capability for manual operation.

B. Valves shall be actuated by a normally closed low wattage solenoid using 24 volts, 50/60 cycle solenoid power requirement. Solenoid shall be epoxy encased. A union shall be installed on the discharge end.

C. Valves shall have plastic ID tags, and be wired to controller in same numerical sequence as indicated on plans.

D. See irrigation legend for manufacturer and model type.

2.10 DRIP VALVE ASSEMBLY

A. Drip Valve Assembly: Pre-assembled by the manufacturer at the factory and consisting of a remote control valve, solenoid, filter, and pressure regulator.

B. Remote Control Valve: Remote control valve shall be electrically operated, single seat, normally closed configuration, equipped with flow control adjustment and capability for manual operation. Body, bonnet, seat, and diaphragm shall be glass reinforced polyamide (GRP). Nuts, bolts, and washers shall be stainless steel 304. Spring shall be stainless steel AISI 302. Minimum operating pressure of 7 psi, maximum operating pressure of 145 psi, water temperature up to 140 degrees F. Remote control valve shall have a plastic ID tag, and be wired to controller in same numerical sequence as indicated on plans. Deviations from plans shall be noted as such on the as-built drawings.

C. Solenoid: Remote control valve shall be actuated by a normally closed low wattage solenoid using 24VAC, 60 Hz, ±10% voltage, 0.22 A inrush current, 0.095 A holding current. Solenoid shall be epoxy encased.

D. Filter: Filter case shall be all plastic with a screw-on filter cover, resistant to chemicals and liquid fertilizers. Filter element shall consist of grooved discs, mounted on a spined, forming a cylindrical filter element, with discs compressed together by a spring located at the bottom of the filter cover, filtration grade shall be 140 mesh. Flow range shall be 0 – 17 GPM with a maximum pressure rating of 140 psi.

E. Pressure Regulator: Low flow pressure regulator shall have a flow range of 0.25 – 4.4 GPM with a regulated pressure of 42 psi and a maximum pressure rating of 145 psi. High flow pressure regulator shall have a flow range of 4.5 – 17.6 GPM with a regulated pressure of 45 psi and a maximum pressure rating of 145 psi.

F. See Irrigation Schedule on Drawings for manufacturer and model.

2.11 QUICK COUPLING VALVES

A. Quick coupling valves shall be a two-piece unit consisting of a coupler seal valve assembly and a removable quick connecting coupler key. A positive, watertight connection shall be made between the coupler key and the valve unit.

B. Quick coupling valve shall be double-lugged type, one-inch (1″) size, designed to withstand a working pressure of 150 psi, heavy-duty red brass construction with built in flow control and a self-closing valve.

C. Quick coupling valve shall be equipped with a lockable, hinged cover with springs for positive closure upon key removal. Covers shall be red brass with a permanently bonded rubber-like vinyl cover, yellow in color.

D. Quick coupler key shall be brass or bronze with an attached swivel hose bib assembly. Key size shall be compatible with quick coupler and of same manufacturer. See irrigation legend for manufacturer and model type.

2.12 VALVE BOXES AND MATERIALS

A. Valve boxes: valve boxes shall be constructed of ABS (acrylonitrile butadiene styrene) plastic, green in color, with rigid base and sides and shall be supplied with bolt lock cover secured with stainless steel bolts. Cover shall be identified as shown on plans. Provide box extensions as required.

B. For gate valves, dripline, flush valves, emitters and wire stub pull boxes use Carson Industries #910 round box, 10” diameter, green in color, or approved equal. For remote control valves three-quarter-inch to two-inch (3/4" - 2"), use Carson Industries #1419-3 box, 17” length x 12” width x 12” depth with flush cover,green in color , or approved equal. For drip assemblies use Carson Industries #1220-3 box, 21” length x 15” width x 12” depth with flush cover,green in color , or approved equal.

C. Install in accordance with the details shown on the plans.

2.13 SPRINKLERS

A. Provide sprinkler product as indicated on Drawings.

B. Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler body and fabricated in accordance with the details shown on the plans.

2.14 DRIP IRRIGATION

A. Provide drip emitters, drip irrigation distribution tubing, and drip components as indicated on Drawings.

2.15 DRIPPERLINE, DRIPPERLINE FITTINGS, AND INTEGRAL DRIPPERLINE COMPONENTS

A. Driperline with Pressure Compensating Emitters and Built-In Check Valves: Dripperline shall be 17mm, nominal sized 1/2” (one-half inch) low density, ultraviolet-resistant, linear polyethylene tubing with internal pressure-compensating, continuous self-cleaning, integral drippers with internal check valves, at a specified spacing interval and discharge flow rate.

1. The dripperline tubing shall be brown in color throughout and shall conform to an outside diameter (O.D.) of 0.66” and an inside diameter (I.D.) of 0.56”.
2. Individual drippers shall be continuous self-cleaning, pressure compensating and welded to the inside of the tubing wall as an integral part of the tubing assembly.
    a. Each dripper shall have a built-in check valve that will hold the pressure exerted by a 4-1/2 feet column of water (2 psi) to ensure that tubing will not drain water on zone shutdown, or allow outside contaminants to enter the dripperline through reverse siphonage.
    b. The dripper shall have its water inlet located in the center of the tubing to ensure it draws water from the cleanest part of the stream or water flowing though the tubing.
    c. The dripper shall have a built-in physical root barrier whereby the water shall exit the dripper from one location and shall exit the tubing from a second location. This physical barrier shall create an air gap inside the tubing.

d. The drippers shall be constructed of three individual pieces: 1) A black-colored dripper containing a filtration system on the inlet side, compensation cell, and recessed chamber with a water outlet; 2) A hard plastic diaphragm retainer with color denoting discharge rate, with chamfered edges and a recessed groove in the center extending the full length of the diaphragm; and 3) A flexible elastomer diaphragm that allows pressure to build up within the chamber to purge sediment or other debris that may not have been captured by the disc filter.

e. Each dripper shall have the ability to independently regulate discharge rates, with an inlet pressure of fourteen-point-seven to seventy (14.7 – 70) psi, at a constant flow and with a manufacturer's coefficient of variability (Cv) of 0.03 or less.

f. Drippers shall be capable of a discharge flow rate of 0.26, 0.4, 0.6, or 0.9 gallons per hour (GPH) between operating pressures of 14.7 - 70 psi for each individual dripper. Dripper discharge flow rate shall be as indicated on the Drawings.

g. Drippers shall be evenly spaced on the dripperline, available at 12", 18", and 24" on-center intervals. Dripper spacing interval shall be as indicated on Drawings.

3. Dripperline shall be Netafim Techline CV Dripperline, or approved equal.

B. Dripperline Fittings: All fittings shall be compatible with components being connected.

1. Barbed Insert Fittings: All barbed fittings shall be constructed of ultraviolet-resistant injection molded brown plastic plastic, having a nominal ouside dimension (O.D.) of 17 mm (0.56") and a nominal inside dimension (I.D.) of 0.24". Each barbed fitting shall have a minimum of two ridges or barbs per outlet with a raised barb nearest the fitting outlet. Barbed insert fittings shall be Netafim Model Numbers TLTEE, TLCOUP, TL2W075MA, TLELL, TLCROS, TL050MA, TL075MA, TL075FTEE, TLIAPE, and TLIAPVC, or approved equal All barbed fittings shall be of one manufacturer and shall be available in one of the following end configurations as a minimum:

a. Barbed insert fittings.

b. Male pipe threads (MPT) with barbed insert fittings.

c. Female pipe threads (FPT) with barbed insert fittings.

2. PVC Insert and Threaded Fittings: All PVC fittings shall be un-plasticized PVC I or PVC II material for threaded or slip fitting tapered socket solvent weld fittings. The type of plastic material and schedule size shall be indicated on each fitting or coupling with raised or recessing markings. Female and male threaded ends shall be capable of mating to standard PVC pipe with tapered threads. PVC insert and threaded couplings shall comply with the following:

a. Socket Fittings: SCH 40 shall be ASTM D2466 and SCH 80 shall be ASTM D2467.

b. Threaded Fittings: SCH 40 shall be ASTM D2464 and SCH 80 shall be ASTM D2464.

3. Insert Adapter for 1" or Larger Polyethylene: Shall be a 2-piece threaded-connection fitting constructed of injection-molded plastic and designed to transition from 1" or larger polyethylene pipe to dripperline. Insert adapter for Polyethylene shall be Netafim Model #TLIAPE-B, or approved equal.

4. Insert Adapter for 1-1/2" or Larger PVC: Shall consist of a rubber grommet and an injection molded plastic insert adapter and designed to transition from rigid 1-1/2" or larger Class 200 or SCH 40 PVC pipe to dripperline. Insert adapter for PVC shall be Netafim Model #TLIAPVC-B with #TDBIT16.5, or approved equal.

5. Dripper Plug Ring: Shall be a pre-formed plastic ring with a rounded inside plug used to plug dripper outlet, constructed of injection-molded plastic of a diameter slightly larger than dripperline tubing. The circular design shall be open on one end to enable it to be slipped over the tubing. Within the interior of this ring (opposite the open end) shall be a rounded plug made to press-fit into the water outlet of the dripper to prevent water emission. Dripper plug ring shall be Netafim Model #TLDPLUG, or approved equal.

6. Dripper Micro-Tubing Adapter: Shall be a pre-formed plastic saddle with a mico-tubing adapter outlet that can be attached over the dripper outlet, allowing water to be moved via micro-tubing to a specific area away from the dripperline location. Adapter shall have an outlet fitting capable of accepting 0.160" x 0.220" micro tubing. Dripper micro-tubing adapter shall be Netafim Model #TLMTUBEADP, or approved equal.
7. Figure 8 Line End: An end closure to allow the dripperline tubing to be folded back upon itself, used as an end line closesure fitting for manual line flushing. Figure 8 line end shall be Netafim Model #TLFIG8, or approved equal.

C. Pipe Clamps: Stainless steel pipe clamps used to secure dripperline tubing to barbed insert fittings for operating pressures in excess of 50 psi.
1. Tubing clamps shall be constructed of 304 AISI stainless steel.
2. Clamps shall be one "ear" type. The "ear" shall be capable of being pinched with a pinching tool to secure the tubing around the barbed insert fitting.
3. Interior clamp wall shall be smooth to prevent crimping or pinching of tubing.
4. Wall thickness of clamps shall be 0.0236" (0.6 mm) with an overall band width of 1/4" (7 mm), 13/16" size.
5. Clamps shall be manufactured by Oetiker, or equal.

D. Soil Staples: Metal wire staples utilized to hold dripperline tubing in place temporarily during construction or set in place permanently. Soil staples shall be Netafim Model #TLS6, or approved equal.

E. Line Flushing Valve: A manual shut-off valve with barbed fittings on the upstream and downstream ends, constructed of injection molded plastic, having a nominal ouside dimention (O.D.) of 17 mm (0.56"). Each barbed fitting shall have a minimum of two ridges or barbs per outlet with a raised barb nearest the fitting outlet. Shut-off valve shall be Netafim Model #TLSOV, or approved equal.

F. In-Line Check Valve: Constructed of injection-molded plastic with an insert inlet and discharge with collar. In-line check valve shall have an opening pressure of 7.3 psi (5m) and a closing pressure of 5.7 psi (4m). It shall have a flow range of 0.9 – 4.4 GPM (200 - 1,000l/h). In-line check valve shall be Netafim Model #TLCV, or approved equal.

2.16 ELECTRICAL CONTROL WIRING

A. Low voltage
1. The electrical control wire shall be direct burial type UF, No. 12 AWG, solid, single conductor, copper wire, U.L. approved. Wire shall be larger size gauge, if required to operate system as designed.
2. Color code wires to each valve. Common wire shall be white. All master control valve or fill valve wires to be blue. All spare wires to be solid red.
3. If multiple controllers are being utilized, and wire paths of different controllers cross each other, both common and control wires from each controller to be of different colors.
4. Control wire connections and splices shall be made with Spears DS-100 Dri-Splice waterproof wire connector with DS-200 Crimp Sleeve and DS-300 Dri-Splice Sealant, or Spears DS-400 Pre-Filled Dri-Splice Waterproof Wire Connector with Crimp Sleeve, or approved equal waterproof wire connector.

B. High voltage:
1. Shall be of type as required by local codes and ordinances.
2. Shall be of proper size to accommodate needs of equipment it is to serve.

C. Wire markers: white, self-laminating, vinyl-impregnated cloth with printed letters and numerals. Legend color shall be black. Background color shall be white. Minimum dimension of complete marker: 3/4" by 1-1/2". Markers shall be Insta-Code PCM series as manufactured by Panduit Corporation, or equal.

D. Tracer wires: shall be direct burial type UF, No. 12 AWG, solid, single conductor, plastic coated copper wire, U.L. approved.

2.17 TRENCH MARKER TAPE

A. Marker tape for pressure pipe shall be an inert plastic film with metallic backing specifically formulated for prolonged underground use. Minimum thickness shall be 4 Mils, minimum width shall be three-inches (3″). Marker tape shall be blue in color and shall have two-inch (2″) black lettering with the inscription "CAUTION: WATER LINE BURIED BELOW". Marker tape shall be Alarmatape as manufactured by Paul Potter Warning Tape, Inc., or equal.

B. Marker tape for direct burial control wire shall be an inert plastic film specifically formulated for prolonged underground use. Minimum thickness shall be 4 mils, minimum width shall be three-inches (3″). Marker tape shall be red in color and shall have two-inch (2″) black lettering with the inscription "CAUTION: ELECTRICAL LINE BELOW". Marker tape shall be as manufactured by Allen Marking Tape, or equal.

2.18 CONCRETE THRUST BLOCKS

A. Size for average safe soil-bearing load of 700-lbs/square feet.

2.19 MAINLINE BEDDING SAND

A. Sand shall consist of natural or manufactured granular material, free of organic material, mica, loam, clay or other substances not suitable for the intended purpose.

2.20 EQUIPMENT TO BE FURNISHED TO OWNER

A. As a part of the contract, the Contractor shall supply the following extra equipment to the Owner's Representative at the conclusion of the Maintenance Period. A signed receipt of the following items by the Owner's Representative will be required at the time of final acceptance.

1. An appropriate padlock and two (2) sets of keys for each Automatic Controller Assembly.
2. Two (2) sets of keys for each Controller unit within the Automatic Controller Assembly.
3. An appropriate padlock and two (2) sets of keys for each Irrigation Booster Pump Assembly.
4. An appropriate padlock and two (2) sets of keys for each Backflow Prevention Assembly Enclosure.
5. Two (2) forty-eight-inch (48") tee wrenches appropriately-sized, for operating any below-grade gate valves.
6. Three (3) sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied on this project.
7. Four (4) quick coupler keys to match manufacturer type of quick coupler.
8. Four (4) sprinklers and nozzles of each type used.
9. Dripperline, dripperline fittings, and dripperline components: Provde ten (50) feet of dripperline tubing, six (6) of each type of fittings used, one (1) line flushing valve, and one (1) spare filter element of the mesh size indicated.

2.21 INCIDENTAL MATERIALS AND EQUIPMENT

A. Furnish all materials and equipment not specified above which are necessary for completion of the work as intended.

PART 3 - EXECUTION

3.1 PREPARATION AND SITE REVIEW

A. Contractor shall consult all other relevant specification sections to determine the extent and character of work specified elsewhere but related to the irrigation system.

B. Contractor shall be responsible for scheduling and coordinating to facilitate the most expeditious completion of the project in a professional and workmanlike manner, including all required irrigation utility connections with other project trades.

C. Contractor shall obtain all information pertaining to locations of all existing and proposed utilities, lines, and appurtenances prior to any irrigation installation.

D. State of California Law: Section 4216/4217 of the Government Code requires a Dig-Alert identification number be issued before a “permit to excavate” will be valid. For a Dig-Alert identification number, call Underground Service Alert toll free at (800) 227-2600, two working days before you dig.

3.2 LAYOUT AND VERIFICATION

A. Locations and Drawings are diagrammatic and approximate only. Actual work shall be changed and adjusted as necessary and as directed to meet existing conditions and obtain complete water coverage.

B. Contractor shall stake out locations of all pipe, valves, equipment, and irrigation heads and emitters using an approved staking method and maintain the staking of the approved layout in accordance with the Drawings. Verify all horizontal and vertical site dimensions prior to staking of heads. Do not exceed spacing shown on Drawings for any given area. If such modified spacing demand additional or less material than shown on the Drawings, notify the Landscape Architect and Resident Engineer before beginning any work in the adjacent area.

C. Minor changes in locations of the above from locations shown shall be made as necessary to avoid existing specimen tree planting or proposed piping, utilities, structures, etc. At the Contractor's expense or when directed by the Landscape Architect and Resident Engineer.

D. The Contractor shall be held responsible for relocation of any items without first obtaining the Landscape Architect’s and Resident Engineer's approval. The Contractor shall remove and relocate such items at his or her expense if so directed by the Landscape Architect and Resident Engineer.

E. Before starting work on irrigation system, carefully check all grades to determine that work may safely proceed, keeping within the specified material depths. The Contractor shall be aware of the fact that the Drawings are based on horizontal dimensions. Actual measurements taken along the slope of a bank will differ from those shown on the Drawings. Mow curbs and specimen trees shall be installed and in-place before installation of irrigation system.

F. No fittings shall be installed on pipe underneath pavement or walls. If such a need should occur, the Contractor shall notify the Landscape Architect and Resident Engineer before beginning any work.

G. All changes shall be recorded on the redline as-built drawings on Friday of every week.

3.3 TRENCHING

A. Perform all trenching and excavations as required for the installation of the work included under this section, including shoring of earth banks to prevent cave-ins.

B. Make trenches for mains, laterals and control wiring straight and true to grade and free of protruding stones, roots or other material that would prevent proper bedding of pipe or wire.

C. Excavate trenches wide enough to allow a minimum of four-inches (4″) between parallel pipe lines and eight-inches (8″) from lines of other trades. Do not install irrigation lines directly parallel or vertically over one another. Maintain three-inches (3″) vertical clearance between irrigation lines. Minimum transverse angle is forty-five (45) degrees. All pipes shall be serviced or replaced without disturbing the other pipes.

D. Trenches for pipelines shall be made of sufficient depth to provide the minimum cover from finished grade as follows:

1. Pressurized mainlines: eighteen-inches (18″) below finish grade to top of pipe, and twenty-four inches (24″) below paved areas to top of pipe, in Schedule 40 PVC sleeves.
2. Non-pressurized lateral lines: twelve-inches (12″) below finish grade to top of pipe, and eighteen-inches (18″) below paved areas to top of pipe, in Schedule 40 PVC sleeves.
3. Control wiring: to the side of the pressurized mainline, and twenty-four-inches (24″) below paved areas in Schedule 40 PVC sleeves.

E. Trenching within "drip line" of existing trees shall only be by written approval of the Landscape Architect and Resident Engineer prior to start of trenching operations.

F. When trenching through areas where imported soil has been spread, deposit imported soils on one side of trench and subsoil on opposite side. Replace imported soil as the top cover when backfilling trench.

G. Trenches through paved areas shall be resurfaced with same material of same quality as existing material as part of contract.

3.4 PIPING ASSEMBLY

A. General:

1. Install assemblies and pipe to conform to respective details and where shown diagrammatically on Drawings, using first class workmanship and best standard practices as approved. All fittings that are necessary for proper connections such as swing joints, offsets, and reducing bushings that are not shown on details shall be installed as necessary and directed as part of the work.
2. Do not install multiple assemblies on plastic lines. Provide each assembly with its own outlet.
3. Dielectric bushings shall be used in any connections of dissimilar metals.

B. Plastic pipe:

1. Gasketed plastic pipe: pipe-to-pipe joints or pipe to fittings shall be made in accordance with manufacturer's specifications.
2. Solvent weld or threaded plastic pipe:
   a. Installation of all pipe and fittings shall be in strict accordance with manufacturer's specifications.
   b. Because of the nature of plastic pipe and fittings, exercise caution in handling, loading and storing, to avoid damage. All pipe and fittings shall be stored under cover until used. Any pipe that has been dented or damaged shall be discarded until damaged section is cut out and rejoined with coupling.
   c. Pipe shall be cut using approved PVC pipe cutters only. Sawed joints are disallowed. All field cuts shall be beveled to remove burrs and excess before gluing.
   d. Pipe ends and fittings shall be wiped with MEK or equal, before welding solvent is applied. Welded joints shall be given a minimum of 15 minutes to set before moving or handling. Excess solvent on the exterior of the joint shall be wiped clean immediately after assembly.
   e. Plastic to metal connections shall be made with plastic adapters and if necessary, short (not close) brass threaded-nipples. Connection shall be made with two (2) wraps of Teflon tape and hand tightened, plus one turn with a strap wrench.
   f. Pipe shall be assembled and welded on the surface. Cure all joints according to manufacturer's specifications before placing into trench. All joints shall cure at least twenty-four (24) hours before permitting water through pipe.
   g. Snake pipe horizontally in trench to allow one-foot (1′) of expansion and contraction per one-hundred feet (100′) feet of straight run.
   h. Threaded pipe joints shall be made using Teflon tape. Solvent shall not be used with threaded joints. Pipe shall be protected from tool and equipment damage during assembly. All damaged pipe shall be removed and replaced immediately. Take up threaded joints with light wrench pressure.
   i. No close nipples or risers are allowed. Cross connections in piping is not allowed.
   j. Center load pipe with small amount of backfill to prevent arching and slipping under pressure. Other than this preliminary backfill, all pipe joints, fittings and connections are to remain uncovered until successful completion of hydrostatic testing and written approval is achieved.
   k. Concrete thrust blocks shall be constructed behind all pipe three-inches (3″) diameter and larger with sufficient bearing to resist the thrust of water at all changes of direction of forty-five (45) degrees or more. Construct thrust blocks for quick couplers as per detail.

3.5 CONNECTIONS

A. Coordinate irrigation piping installations and specialty arrangements with schematics on Drawings and with requirements specified. If Drawings are explicit enough, these requirements may be reduced or omitted.

B. Comply with requirements for piping specified in Division 22 Section "Facility Water Distribution Piping" for water supply from exterior water service piping, water meters, protective enclosures, and backflow prevention devices.

C. Drawings indicate general arrangement of piping, fittings, and specialties.

D. Install piping adjacent to equipment, valves, and devices to allow service and maintenance.

E. Connect wiring between controllers and automatic control valves.

3.6 FLUSHING AND TESTING

A. Flushing:

1. Openings in piping system during installation are to be capped or plugged to prevent dirt and debris from entering pipe and equipment. Remove plugs when necessary to flush or complete system.
2. After completion and prior to the installation of any terminal fittings, the entire pipeline system shall be thoroughly flushed to remove dirt, debris, and/or other material.

B. Testing:

1. After flushing, the following tests shall be conducted in the sequence listed below. The Contractor shall furnish all equipment; materials and labor necessary to perform the tests and all tests shall be conducted in the presence of the Landscape Architect and Resident Engineer.
2. Water pressure tests shall be performed on all pressurized mainlines and non-pressurized lateral lines before any couplings, fittings, valves and the like are concealed.
3. Immediately prior to testing, all irrigation lines shall be purged of all entrapped air or debris by adjusting control valves and installing temporary caps forcing water and debris to be discharged from a single outlet.
4. Test all pressurized mainline at one-hundred-and-fifty (150) psi for a minimum time period of four (4) hours with an allowable loss of five (5) psi. Pressure and gauges shall be read in psi and calibrated such that accurate determination of potential pressure loss can be ascertained. Pump used to energize system for pressure test shall be completely removed from the system prior to start of time period, and not reactivated at any time during the pressure test.
5. Test all non-pressurized lateral line at one-hundred (100) psi for a minimum time period of two (2) hours with an allowable loss of five (5) psi. Pump used to energize system for pressure test shall be completely removed from the system prior to start of time period, and not reactivated at any time during the pressure test.
6. Test all non-pressure drip pipe at forty (40) psi for a minimum time period of one (1) hour with an allowable loss of three (3) psi.
7. Repair leaks and retest until the system meets requirements and no leaks exist. Any leaks, which occur during test period, will be repaired immediately following the test. All pipe shall be re-tested until final written acceptance is achieved.
8. All materials and installation procedure used for making corrections are to be the same as specified herein.

3.7 PIPE BACKFILLING AND COMPACTING

A. Irrigation trenches shall be carefully backfilled with material approved for backfilling and free of rocks and debris one-inch (1″) in diameter and larger.

B. Under no circumstance is pipe to rest on concrete, rock, wood blocks, or other potential deleterious items.

C. Backfill shall be compacted with approved equipment to ninety-percent (90%) maximum density. Finish grade of all trenches shall conform to adjacent grades without clips or other irregularities. Dispose of excess soil or debris off site at Contractor's expense.

D. Install appropriate trench marker tape on a continuous run of all pressurized line (mainline pipe) trenches, at a depth of nine-inches (9″) below finish grade.

E. Restore all surfaces and repair existing underground installations damaged or cut as a result of the excavation to their original condition, satisfactory to the Owner's Representative.

F. Any settling of backfill material during the maintenance or warranty period shall be repaired at the Contractor's expense, including any replacement or repair of soil, lawn, and plant material or paving surface. Surface drainage flows shall be maintained by design.

3.8 SLEEVES

A. Verify all irrigation sleeve locations prior to beginning work in this section. Flag all existing sleeves and conduits installed by other trades. Report any conflicts and discrepancies to the Construction Manager immediately.

B. Install sleeves to accommodate all pipes and wiring installed under paving, sidewalks, stairs, paths, and other hardscape areas prior to asphalt, concrete, and hardscape installations.

C. Install a separate sleeve to route each run of irrigation pipe or wiring bundle (including mainline pipe, lateral line pipe, wiring, etc).

D. Sleeves shall be schedule 40 PVC, unless noted otherwise..

E. Sleeves shall be two (2) times the outside diameter of the encased pipe or wiring bundle to be sleeved.

F. Extend sleeve ends twelve-inches (12") beyond the edge of the paved surface.

G. All ends of sleeves shall be capped until use.

H. Compact backfill around sleeves to 95% Modified Proctor Density, within two-percent (2%) of optimum moisture content in accordance with ASTM D1557.

I. Mark location of sleeves with stakes for reference during construction activities. Remove stakes prior to completion of construction activities and prior to final acceptance by owner.

3.9 INSTALLATION OF EQUIPMENT

A. Automatic Controller Assembly:

1. Install as per manufacturer's / supplier’s instructions and/or detail, where indicted on the plans. The Owner's Representative shall approve location prior to installation.
2. Remote control valves shall be connected to the controller in numerical sequence as shown on the plans.
3. Controller shall be tested with complete electrical connections. The Contractor shall be responsible for temporary power to the controller assembly for operation and testing purposes.
4. Connections to control wiring shall be made within the pedestal of the controller assembly. All wire shall follow the pressure mainline pipe insofar as possible.
5. Electrical wiring shall be “hard-wired” in an appropriate rigid conduit pursuant to all appropriate codes and regulations, from the controller assembly to the electrical supply. The Electrical Contractor shall be responsible for installing all wiring to the controller, in order to properly complete this installation. A disconnect switch shall be included.

6. Inside the Automatic Controller Assembly, the letter of the controller (as designated on the plans) shall be stencil painted on the controller cabinet door with black or white enamel paint.
7. Upon completion of installation, the entire Automatic Controller Assembly shall be inspected and tested for proper connections and complete and full operation by the manufacturer's and/or supplier's representative, including proper operation and interface with the flow sensor, flow sensor data interface, master control valve, etc.
8. A reduced copy of the as-built drawings of the irrigation plan shall be color-coded by stations and laminated in plastic, and shall be mounted on the inside of each controller enclosure for maintenance personnel.

B. Master Control Valve, Flow Sensor, and Flow Sensor Data Interface:
1. The Master Control Valve, Flow Sensor, and Flow Sensor Data Interface shall be installed as per manufacturer's and/or supplier's recommendations.
2. Flow sensor wire shall be installed in gray PVC Schedule 40 pipe. No wire splices allowed within the conduit.
3. Install so that all components communicate appropriately with each other and the irrigation controller.
4. Ensure that the function of each component is fully operational, with flow sensor settings based upon site conditions to prevent potential property damage.

C. Isolation Valves (Gate Valves / Ball Valves / Globe Valves, etc):
1. Install as required at locations designated on Drawings within an appropriate valve box.

D. Check Valves / Anti-Drain Valves:
1. Install as shown on details at locations necessary to prevent low head run off.
2. Install in-line anti-drain valves as warranted by site conditions to alleviate low head drainage.
3. See below for dripperline in-line check valves.

E. Remote Control Valves and Valve Manifolds:
1. Install as shown on detail at locations designated on plans and house each valve in an individual box. Group valves together where practical and locate in shrub areas.
2. Remote control valve manifolds and quick-coupling valves shall be connected separately on the mainline, allowing use of a quick coupler with all remote control valves shut off.
3. Review all valve box locations with Owner's Representative prior to installation of valves. Install boxes no farther than twelve-inches (12″) from edge of paving and perpendicular to edge of paving and parallel to each other. Allow six-inches (6″) clearance between adjacent boxes.

F. Drip Valve Assembly
1. Install as shown on detail at locations designated on plans and house each valve assembly in an individual box. Group valves together where practical and locate in shrub areas.

G. Quick Coupling Valve:
1. Install quick coupling valve as shown in detail with thrust block and locate where indicated on plans. Install within valve box, and in accordance with plans and details.
2. In turf areas, such equipment shall be installed in a valve box set to finish grade.

H. Valve Boxes:

1. Install one valve box for each type of valve installed as per the details. No more than one valve shall be installed in any single valve box.
2. All valve boxes shall be set two-inches (2") above finish grade in shrub and groundcover areas, and flush with finish grade in turf areas.
3. All valve boxes shall be set parallel with each other and with adjacent hardscape element (walkways, curbs, vehicular drives, buildings, fences, etc).
4. Gravel sump shall be installed after compaction of all trenches. Final portion of gravel shall be placed inside valve box after valve is backfilled and compacted.
5. All valve boxes shall have proper base support with unmortared bricks, and any necessary extensions to provide proper access and prevent any settling of boxes. Provide extensions as required. Fill in any settling adjacent to boxes.
6. Boxes shall be installed so that all valve handles and other components operate freely and function properly within the box (open/close, etc).
7. Heat-brand valve number and controller letter on top of valve box lid, in one-and-one-half-inch (1-1/2") size letters.

I. Sprinklers:

1. All mainlines and lateral lines, including risers, shall be flushed and pressure tested before installing sprinkler heads, after which a water coverage test shall be performed.
2. Install specified sprinkler heads as shown in details at locations shown on the plans. Adjust layout for full coverage, spacing of heads shall not exceed the maximum spacing recommended by the manufacturer.

J. Dripperline:

1. Dripperline tubing and fittings shall be installed per details, Drawings, and Specifications.
2. Dripperline tubing shall be installed subsurface at a depth of three to four inches (3" - 4") below finish grade of soil, not finish grade of bark mulch or D.G. Do not install dripperline tubing on the soil surface.
3. Over Excavation: Over-excavate the entire area to a depth of 4" below final finish grade of soil. Plant all specimen trees and shrubs 15 gallon size and larger, then place dripperline at the row spacing interval indicated on the plans.
4. Dripperline can be installed with the water outlets facing up, down, or sideways. In irregular areas, some water outlets could end up too close to fixed improvements and may have to be capped off with a dripper plug ring.
5. Barbed Insert Fittings: Connect dripperline to barbed insert fittings by pushing the tubing on and over both barbs of the fitting until the tubing has seated against another piece of tubing or has butted against another portion of the barbed fitting. For water pressures in excess of the 50 psi, or the maximum stated system pressure for the dripperline, whichever is less, use stainless steel clamps as noted in paragraph "Pipe Clamping" below.
6. Threaded Fittings: Use only Teflon tape on all threaded connections. Connections shall be made with one-and-one-half (1-1/2) wraps of Teflon tape and hand tightened, plus one turn with a strap wrench.
7. Install 6" wire staples permanently at 5 feet on-center to secure dripperline tubing subsurface prior to commencing backfilling operations. Install 2 staple at every change-of-direction fitting. Staples shall remain in place subsurface even after backfilling is completed.

8. Cap or plug all openings as soon as lines have been installed to prevent the intrusion of materials that might obstruct the pipe and tubing. Leave in place until removal is necessary for completion of installation.
9. Pipe Clamping: When design-operating pressure exceeds 50 psi, or maximum stated system pressure for the dripperline, whichever is less, stainless steel pipe clamps shall be used to secure dripperline tubing to barbed fittings. Slip pipe clamps over tubing before slipping tubing over barbed insert fitting. Place clamp between the first and second ridge of the barbed fittings and crimp the “ear” of the clamp tightly. Crimp the “ear” twice to ensure proper seating.
10. Flushing: Prior to backfilling and before connection of the line flushing valves, flush the entire system to remove any dirt or sediment that may have entered the system during the installation.
11. Line Flushing Valve: Install the line flushing valves below grade at the hydraulic termination points in each system, at the point farthest away from the source. Locate in a valve box with the top of the line flushing valve facing horizontally or vertically. Include a minimum of 1 cubic foot of 3/4" size gravel in the bottom of the valve box. Valve box shall be installed as per detail. Line flushing valves shall be installed with the dome portion facing sideways. Install 1 (one) line flushing valve for every fifteen (15) GPM of zone flow. If locations are not shown on the Drawings, install line flushing valve(s) at a point farthest away from the source as possible, typically on an exhaust header.
12. In-line Check Valve: Install in-line check valves for every four-and-one-half (4-1/2) feet of elevation change within individual dripperline zones.
13. Testing: Prior to backfilling, open the remote control valve and operate each circuit to check for leakage around both barbed and threaded PVC fittings. Make necessary corrections to stop leaks.
14. Retest: Retest those systems where leaks were corrected before commencing backfilling operations.

K. Wiring:
1. Low voltage wiring:
    a. Control wiring between controller and electrical valves shall be installed in the same trench as the mainline where practical. The wire shall be bundled and secured to the lower quadrant of the trench at ten-feet (10′) intervals with plastic electrical tape.
    b. When the control wiring cannot be installed in same mainline trench it shall be installed a minimum of 18-inches (18″) below finish grade and a bright colored plastic ribbon with suitable markings shall be installed in the trench six-inches (6″) below grade directly over the wire.
    c. An expansion loop shall be provided every five-hundred-feet (500′) in a box and inside each valve box. Expansion loop shall be formed by wrapping wire at least eight (8) times around a three-quarter-inch (3/4″) pipe and then withdrawing pipe from the coiled wire.
    d. Provide one control wire to service each remote control valve in the system.
    e. Provide one common wire per controller.
    f. Run two (2) spare #12 wires from controller along entire mainline to last electric remote control valve on each, and every leg of mainline. Label spare wires at controller and wire stub to be located in a box.
    g. All control wire splices not occurring at control valve shall be installed in a separate splice valve box.
    h. Wire markers (sealed, 1” to 3” square) are to identify control wires at valves and at terminal strips of controller. At the terminal strip mark each wire clearly indicting valve circuit number.

i. Control wire connections and splices shall be made with approved waterproof wire connectors only.

j. Waterproof wire connectors shall be installed as per manufacturer's specifications.

k. Provide pull boxes for control wiring where wire runs exceed three-hundred feet (300′) in length, and at all changes in direction greater than forty-five (45) degrees.

l. Control wire splices allowed only on runs of more than three-hundred feet (300′) in length.

m. In-line wire splices shall be made only in valve boxes or pull-boxes, with approved waterproof wire connectors.

2. High voltage wiring for Automatic Controller Assembly:

a. All electrical work shall conform to any and all local codes, ordinances, and any authorities having jurisdiction.

b. All high voltage electrical work shall be performed by a State of California Licensed Electrician.

c. The Contractor shall provide 120-volt power connection to the Automatic Controller Assembly, unless noted otherwise on plans.

3. Tracer Wire:

a. Tracer wire shall be installed with non-metallic plastic irrigation mainlines where controller wires are not buried in the same trench as the mainline.

b. The tracer wire shall be placed on the bottom of the trench under the vertical projection of the pipe with spliced joints soldered and covered with insulation type tape.

c. Tracer wire shall be of a color not used for valve wiring. Terminate wire in a valve box. Provide enough length of wire to make a loop and attach wire marker with the designation "tracer wire".

3.10 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. Submit written documentation to the Landscape Architect and Resident Engineer from the factory-authorized service representative that systems are fully functional and installed correctly.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Any irrigation product will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.11 STARTUP SERVICE

A. Perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Verify that controllers are installed and connected according to the Contract Documents.
   3. Verify that electrical wiring installation complies with manufacturer's submittal and governing codes.

3.12 ADJUSTMENT AND COVERAGE TEST

A. Adjustment:
   1. The Contractor shall flush and adjust all sprinkler heads, valves and all other equipment to ascertain that they function according to the manufacturer's data.
   2. Adjust all sprinkler heads so as to not overspray onto walks, roadways, buildings, and other hardscape elements when under maximum operating pressure and during times of normal prevailing winds.
   3. All sprinkler heads shall be set perpendicular to finish grade unless otherwise designated on the plans or details.
   4. The Contractor shall be responsible for adjusting watering requirements for plant material installed until Final Acceptance by the Owner, including modifications to the irrigation system as necessary to establish healthy, viable plantings.

B. Coverage test:
   1. The Contractor shall perform the coverage test for the Landscape Architect and Resident Engineer after all sprinkler heads have been installed, flushed and adjusted. Each section is tested to provide uniform and adequate coverage of the areas serviced.
   2. Any systems that require adjustments for full and even coverage shall be done by the Contractor prior to final acceptance at the direction of the Landscape Architect and Resident Engineer at no additional cost. Adjustments may also include realignment of pipes, addition of extra heads, and changes in nozzle type or size.
   3. The Contractor shall immediately correct all unauthorized changes or poor installation practices at no additional cost.
   4. The entire system shall be operating properly with written approval prior to any planting operations.

3.13 CLEAN-UP AND SAFE ENVIRONMENT

A. As project progresses, Contractor shall maintain all areas in a neat and safe manner, and remove unsightly debris as necessary. After completion of project each day, Contractor shall remove all debris and containers used in accomplishing work. Contractor shall be responsible for disposing of, off site, at no additional expense, any trash or debris generated by the installation of the work.

3.14 GENERAL MAINTENANCE AND THE MAINTENANCE PERIOD

A. General maintenance shall begin immediately after installation of irrigation system. The general maintenance and the maintenance period shall include the following:

1. On a weekly basis the Contractor shall keep the irrigation system in good running order and make inspections on the entire system for proper operation and coverage. Contractor shall continue to adjust sprinkler nozzles as necessary to obtain optimum coverage and minimum overspray of water on hardscape elements throughout the Maintenance Period. Repair and cleaning shall be done as necessary to keep the system in full operation.
2. Drip irrigation: Flush lateral systems one (1) time per month minimum during the Maintenance Period.
3. Records of all timing changes to control valves from initial installation to time of final acceptance shall be kept and turned over to the Owner's Representative at the time of final acceptance.
4. During the last week of the Maintenance Period, provide equipment familiarization and instruction on the total operations of the system to the Owner's Representative and to the personnel who will assume responsibility for running the irrigation system. A signed receipt by the Owner's Representative that the equipment familiarization and instruction occurred will be required at the time of final acceptance.
5. At the end of the Maintenance Period, submit all operations logs, manuals, instructions, schedules, keys and any other equipment necessary for operation of the irrigation system to the Owner's Representative, who will assume responsibility for the operations and maintenance of the irrigation system. A signed receipt by the Owner's Representative that these items are received will be required at the time of Final Acceptance.

B. The Maintenance Period for the irrigation system shall coincide with the ninety (90) day Maintenance Period for the landscaping materials, see Section 32 90 00 - LANDSCAPING.

END OF SECTION

SECTION 32 90 00

LANDSCAPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including general and supplementary conditions and Division I specifications, apply to work of this section.

1.2 SUMMARY

A. Section includes (not all inclusive):
   1. Plants.
   2. Planting soils, soil amendments, and fertilizers.
   3. Tree stabilization.
   4. Erosion control matting and fiber rolls.
   5. Landscape boulders.
   6. River rock cobble mulch.
   7. D.G.
   8. Root barriers.
   9. Filter fabric.

1.3 SCOPE OF WORK

A. The work includes all labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of "landscaping," complete as shown on the drawings and as specified herein.

1.4 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Brown Trunk Height (BTH): Palm height measurement. Measured from finish grade to lowest viable frond petiole. Differs from ANSI Z60.1 definition for “trunk height”.

C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

D. Finish Grade: Elevation of finished surface of planting soil.

E. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes (not all inclusive) insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides.

F. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

G. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, palms, ground covers, turf grasses, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

H. Planting Area: Areas to be planted.

I. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

J. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees or shrubs below the soil surface.

K. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

L. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

M. Trunk Flare: See root flare.

1.5 VERIFICATION OF EXISTING CONDITIONS

A. All scaled dimensions on the drawings are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions, quantities, and grade elevations, and shall immediately inform the Owner's Representative of any discrepancies. Submit with the bid the proposed source of import soil (if utilized) and a recent test evaluation on the soil.

B. Prior to the excavation for planting or placing of plant materials, the Contractor shall verify the location of all underground utility lines and other improvements, and take proper precautions to avoid damage to such improvements. In the event of conflict between such improvements and plant locations, the Contractor shall notify the Owner's Representative, and arrangements will be made for relocation as necessary. Failure to follow this procedure places upon the Contractor the responsibility for making any and all repairs for damage resulting from work as herein specified at his own expense.

C. The specified soil amendments and their rates of application are for bidding purpose only. The Contractor shall verify the soil conditions through soil testing. See Part 3 for execution of soil amendments.

1.6 SUBMITTALS AND SUBSTITUTIONS

A. Upon 15 days after the Contractor has received the Owner's notice to proceed, the Contractor shall submit to the Landscape Architect and Resident Engineer three (3) typewritten lists of all materials proposed with quantities, size, quality, and source.

B. Prior to installation of any landscape elements, the Contractor shall submit for approval by the Landscape Architect and Resident Engineer, a list of all materials and equipment proposed for use. Submit product data, catalog cut sheets, and/or other types of pertinent information to the Landscape Architect and Resident Engineer for approval, such as (not all inclusive):

1. Electronic photos in JPEG format of each size and species of specimen tree, fifteen (15) gallon size, 24-inch box size, and larger. Photos shall be an accurate representation of the actual tree specimens to be utilized on the project. Photos shall be transmitted to the Landscape Architect and Resident Engineer via e-mail and/or other electronic media. Identify each photograph with the full scientific name of the plant (genus, species, variety, cultivar, etc), plant size, and name of the growing nursery (under separate text if needed). Include a scale rod or other measuring device in each photograph. For species where more than 10 plants are required, include a minimum of three photographs of that

species showing the average plant, the best quality plant, and the worst quality plant to be furnished.

2. Tree standpipe components, including PVC drainpipe, filter fabric, and drain grates.
3. Staking and tying materials.
4. All soil conditioners, soil amendments, fertilizers, and other chemicals.
5. Imported soil (reference Part 2, Imported Soil of this section).
6. Root barrier.
7. Planter edging.
8. Filter fabric.
9. Landscape boulders.
10. River rock cobble mulch.
11. Decomposed granite.
12. Erosion control matting.
13. Fiber rolls.
14. Pesticides: Include copies of sample label and Material Safety Data Sheet (MSDS).

C. Samples for verification for each of the following:

1. Rock Cobble Mulch: 15 lb minimum of mulch required, labeled with source of material. Sample shall be typical of the lot of material to be delivered and installed on the site; provide an accurate indication of color, texture, and makeup of the material.
2. Decomposed Granite: 1-quart volume of each inorganic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
3. Filter fabric: 12 by 12-inches.
4. Root barrier: Width of panel by 12-inches.
5. Actual samples of the soil amendments shall be submitted to the Landscape Architect and Resident Engineer, only if requested by the Landscape Architect and Resident Engineer after approval of the soil test.

D. Qualification Data: For Landscape Installer.

E. Certificates, trip slips, and invoices for all soil amendments, plant materials, rock products, and bark mulch shall be provided to the Owner's Representative prior to final acceptance of the work.

F. Substitutions for the indicated materials will only be permitted provided the substitute materials are approved in writing, in advance, by the Landscape Architect and Resident Engineer and the Owner's Representative. All substitute materials shall conform to the requirements of these specifications. If accepted substitute materials are of less value than those indicated or specified, the contract price will be adjusted in accordance with the provisions of the contract.

G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a typical calendar year. Submit before expiration of required Maintenance Periods.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants.

1. Installer's Field Supervision: Require Installer to maintain an experienced and qualified full-time supervisor on project site when landscaping is in progress.

B. Soil test shall be submitted to an approved and qualified laboratory. Testing methods should comply with the United States Department of Agriculture Handbook Publication No. 60, Methods of Soil Analysis published by the Soil Science Society of America and peer-viewed methods published in scientific journals. Evaluations and recommendations should be based on University of California publications and peer-viewed articles published in scientific journals.

1. The Owner's Representative shall appoint a representative to oversee soil sampling that may be required. The time, depth, location, and number of samples to be taken as per instructions from the Owner's Representative. A minimum of three (3) representative samples shall be taken from random and varied locations of the project site that will receive landscaping installation. Samples should represent major conditions of exposed cut soils, fill soils, and native undisturbed soil. Sample from the top foot for ground cover and shrubs. Sample from the expected depth for large container stock. Label each sample for location/origin, type of soil condition visibly observed, and sampling depth. Laboratory report shall identify each sample with same information. All samples taken shall be split into two samples, one half will go to a qualified laboratory by the Contractor (at his or her expense) and the other half will be retained by the Owner's Representative. All samples shall be at least one pint in volume. All samples shall go to an approved soil-testing laboratory. Approved soil-testing laboratories are as follows:

   a. Wallace Laboratories, 365 Coral Circle, El Segundo, CA 90245 -Phone: (310) 615-0116 - Fax: (310) 640-6863, http://www.bettersoils.com
   b. Soil & Plant Laboratory, Inc., 1594 N. Main Street, Orange, CA 92667 - Phone: (714) 282-8777 - Fax: (714) 282-8575, http://www.soilandplantlaboratory.com/
   c. Fruit Growers Laboratory, Inc., 853 Corporation Street, Santa Paula, CA 93061-0272 - Phone: (805) 659-0910 - Fax: (805) 525-4172, http://www.fglinc.com/
   d. or approved equal.

2. The Contractor shall provide the Owner's Representative and the Landscape Architect and Resident Engineer with a copy of the written report by the approved laboratory. All soil samples shall be analyzed for:
   a. pH measurement in the saturated extract paste.
   b. Determination whether limestone is present or not.
   c. Percent water in saturation extract.
   d. Electrical conductivity of the saturated extract (salinity ECe)/soluble salts.
   e. Saturation extract analysis for the major soluble ions: calcium, magnesium, sodium, potassium, chloride, nitrate and sulfate.
   f. Measurement of sodicity (Sodium Adsorption Ratio).
   g. Concentration of boron in saturation extract.
   h. Extractable nutrients and minerals, including:
      1) potassium
      2) phosphorus
      3) sulfur
      4) magnesium
      5) iron
      6) manganese
      7) zinc
      8) copper
      9) boron
      10) sodium
      11) molybdenum

i. Problem minerals which may be present including:
   1) aluminum
   2) arsenic
   3) barium
   4) cadmium
   5) chromium
   6) cobalt
   7) lead
   8) lithium
   9) vanadium

3. The extraction methods utilized by the laboratory must be standard methods. Interpretation of the data must be given. The laboratory shall also provide an estimate of the soil texture and soil organic matter.

4. Each soil analysis shall include written recommendations for soil treatments and soil amendments to be added based upon test results. These recommendations shall include:
   a. Volume of soil amendment per 1,000 sq.ft. and cu.yd. of backfill mix.
   b. Pounds of gypsum per 1,000 sq.ft. and cu.yd. of backfill mix.
   c. Pounds of soil sulfur per 1,000 sq.ft. and cu.yd. of backfill mix.
   d. Pounds of iron sulfate per 1,000 sq.ft. and cu.yd. of backfill mix.
   e. Pounds of pre-plant fertilizer per 1,000 sq.ft. and cu.yd. of backfill mix.
   f. Pounds of soil polymers per 1,000 sq.ft.
   g. Recommendation for soil leaching.
   h. Recommendation for tree drain installation.
   i. Pounds of maintenance fertilizer per 1,000 sq. Ft. and analysis.
   j. Recommendation for soil wetting agent and application rate.
   k. Percent of site soil-to-soil amendment in backfill mix.
   l. Whether or not soil polymers need to be added to soil.

5. If any of the above listed items are not recommended, the recommendation shall call for zero volume or zero poundage per 1,000 square feet. All soil test costs will be the responsibility of the Contractor.

1.8 WARRANTEES AND REPLACEMENTS

A. Warrantee: All plant material 15-gallon size and larger shall be guaranteed to live and grow in a healthy condition during the Contract Period, Maintenance Period, and for a one (1) year period from the date of final acceptance. The Contractor shall not be held responsible for failure due to neglect by the Owner, vandalism, etc. during the guarantee period. Report such conditions to the Owner's Representative immediately in writing.

B. All plant material smaller than 15-gallon size shall be guaranteed to live and grow in vigorous, healthy, and upright condition for a minimum of ninety (90) days after final acceptance of work (excluding seasonal color).

C. Replacement: All plants not healthy and in a vigorous growing condition as determined by the Owner's Representative shall be replaced immediately. Plants used for replacement shall be the same kind and size as specified in the plant legend as shown on the drawings. They shall be furnished, planted, and fertilized as originally specified at no cost to the Owner.

1.9 PROTECTION OF EXISTING IMPROVEMENTS

A. During the construction and Maintenance Period, the Contractor shall take every precaution to protect and avoid damage to sprinkler heads, irrigation lines, drainage lines, existing underground facilities, paving, structures, fixtures, and existing plantings. The Contractor shall be held responsible for any and all damage to such improvements and shall completely repair or replace the same at no cost to the Owner.

1.10 PROTECTION OF EXISTING PLANT MATERIAL

A. It is the intent of the project that certain of the existing plant materials shall be retained. Prior to clearing and grubbing, the Contractor shall identify to the Owner's Representative those plants that are to remain.

B. All existing plants that are to remain in the project shall be tagged and identified by the Contractor prior to start of work. Contractor shall provide maintenance for existing material during construction, including the assurance of adequate irrigation applications. Contractor shall not hinder or inhibit maintenance and irrigation coverage of existing and surrounding vegetation during construction.

C. Damage to a plant that results in death or permanent disfiguration shall result in the complete removal of the plant, including roots from the site by the Contractor. The Contractor at his or her own expense shall replace the plant with one of equal value as established by the Landscape Architect and Resident Engineer or reimburse the Owner the cost of said replacement if a replacement cannot be obtained. The Landscape Architect and Resident Engineer shall be the sole judge of the replacement of the plant.

D. All existing plant material to remain shall be protected at all times from damage by personnel and equipment. All damage by the Contractor to existing vegetation shall be repaired and/or replaced with equal material of the same species at his or her own expense.

E. The Contractor shall ensure that no foreign or deleterious material and/or liquid (such as, but not all inclusive: paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, or the like) be deposited or allowed to be deposited in any soil within any planting area, or within six-feet (6') of the trunk of a vine in a planting pocket. Should any such pollution of the soil occur, the Contractor shall remove said soil and included pollution as directed by the Owner's Representative and replace it with imported soil at no expense to the Owner (reference Part 2.5, IMPORTED SOIL in this section for a description of the replacement soil characteristics).

F. Where it is necessary to excavate in close proximity to any existing plant material, all possible caution shall be exercised to avoid injury to existing roots and trunk. Excavation within the drip line (a line drawn directly under the tips of its outermost branches) on any existing tree or large shrub shall be done only by careful hand digging, tunneling (water jetting), and/or pneumatically underneath or around existing roots one-inch (1") and larger in diameter. Keep any exposed roots in open trenches shaded with moist burlap or moist canvas at all times. Cutting of any roots one-inch (1") and larger in diameter shall be done only under the approval of the Owner's Representative, and shall be recorded in a Tree Root Pruning Log (TRP Log) that shall be presented to the Owner’s Representative upon completion of the project. The TRP Log shall identify for each affected tree: tree species, accurate description of the tree location within the site, approximate trunk diameter at breast height (DBH), root pruning description, and the date of root pruning. The root pruning description within the TRP Log shall give an accurate description of each root pruned for each affected tree, including the diameter size of the root at the pruning cut, the distance away from the trunk where the root was pruned, and the relative side (north, east, west, south) on the affected tree. Do not treat cut roots with any sealing type paints.

1.11 DELIVERING AND INVOICING OF MATERIALS

A. The Contractor shall notify the Landscape Architect and Resident Engineer in advance when material is scheduled for each delivery, in order to ensure satisfactory coordination of delivery and to expedite the required inspection at the point of delivery. The delivery of the material shall include invoices certifying that subject material has been inspected as required by the State Agricultural Code prior to acceptance or installation. Particular care, using approved equipment, shall be exercised to ensure safe loading, unloading, shipping and handling for all material from source to in place locations indicated on the drawings.

B. The Contractor shall furnish the Landscape Architect and Resident Engineer with three (3) copies of signed, legible certificates and/or invoices stating the quality and quantity of all items herein specified at time of delivery. Recommendation shall be made by the Landscape Architect and Resident Engineer to the Owner to stop work progress until certificates are received and reviewed by the Landscape Architect and Resident Engineer.

C. Upon delivery of materials and/or completion of all soil amending and with the heretofore specified signed copies of required certificates, trip slips and invoices for soil preparation materials the Landscape Architect and Resident Engineer shall invoice such material, comparing the total quantities of each material furnished against the total area of each operation. If the minimum rates of application have not been met, the Landscape Architect and Resident Engineer will require the distribution of additional quantities of these materials to fulfill the minimum application requirements specified.

D. After installation of plant materials, but prior to the pre-maintenance site observation, the Landscape Architect and Resident Engineer, with the heretofore specified signed copies of the required certificates and related items, shall invoice such material, comparing the total area and/or the amounts specified. If the minimum amounts have not been furnished, the Landscape Architect and Resident Engineer will require the installation of additional materials to fulfill the minimum requirements specified.

1.12 SITE OBSERVATIONS

A. Site observations herein specified shall be made by the Landscape Architect and Resident Engineer during regular business hours. The Contractor or his authorized representative shall be on the site at the time of each observation. The Contractor will not be permitted to initiate the succeeding step of work until he has received approval to proceed by the Landscape Architect and Resident Engineer. The Contractor shall notify the Landscape Architect and Resident Engineer of a site observation at least three (3) business days in advance of an observation.

B. All changes and deviations to the plans and specifications shall be communicated to the Construction Manager, and shall be confirmed in writing.

C. The Contractor shall have sufficient work personnel available during normal working hours to correct deficiencies immediately upon request of the Landscape Architect and Resident Engineer. Such repair or re-work services are to be performed without interference of regular project schedule.

D. Site observations will be required for the following parts of work:

1. Pre-Construction Meeting - Immediately prior to the commencement of work of this section, the Owner's Representative, Contractor, and Landscape Architect and Resident Engineer shall meet for the approval of the materials specified, equipment, schedule of work and the method of installation.
2. Layout of Specimen Trees - when trees are spotted in place for planting, but before planting holes are excavated.

3. Incorporation of Soil Amendments - Specified soil amendments are for bidding purposes only. A final soil test performed by an approved laboratory shall be submitted and paid for by the Contractor for agricultural suitability recommendations and approved by the Landscape Architect and Resident Engineer before planting begins.

4. Finish Grading and Approval of Plant Material: Upon the completion of soil amending, the finish grading and planter edging layouts in the field will be approved prior to planter edging installation. Shrub and tree samples, three (3) each of all varieties and sizes (shrubs 5-gallon and under, trees 15-gallon and under) shall be submitted for approval at the site a minimum of fifteen (15) days prior to planting operations for quality, size, variety, vigor, and rooting characteristics. Approved samples shall remain on the site and shall be maintained, by the Contractor as standards of comparison for plant materials to be furnished.

5. Layout of Plant Materials: When material is spotted in place for planting, but prior to excavation of planting holes.

6. Pre-Maintenance Period Observation: When planting and all specified work has been installed and completed, the Landscape Architect and Resident Engineer will prepare a written “punch list” indicating all items to be corrected. These items must be completed prior to initiating the beginning date of the maintenance period. The Landscape Architect and Resident Engineer will inform the Owner and Contractor of the actual date of the start of the maintenance period in writing. This observation is not the final acceptance of the project, and does not relieve the Contractor from any of the responsibilities in the contract documents.

7. Final Site Observation and Acceptance of the Project: At the conclusion of the maintenance period a final site observation will be made. The Contractor shall show all corrections made from the “punch list.” Any items deemed not acceptable shall be reworked and the maintenance period will be extended. The Contractor will be notified in writing that the contract work and maintenance period has been accepted or that the maintenance period has been extended to correct any deficiencies remaining. Final acceptance of the project shall establish the beginning date for the guarantee period.

E. Site observations of the work shall not relieve the Contractor of the obligation to fulfill all conditions of the contract.

1.13 SUSPENSION OF WORK

A. The Landscape Architect and Resident Engineer shall recommend to the Owner’s Representative any necessity to suspend the work wholly, or in part, for such period or periods as he/she may deem necessary due to unsuitable weather, or such other conditions as are considered unfavorable for the reasonable performance of the work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or to perform any or all provisions of the contract.

B. If it should become necessary to stop work for an indefinite period, the Contractor shall store all materials in such a manner that they will not become an obstruction nor become damaged in any way, and he shall take every precaution to prevent damage or deterioration of the work performed. The Contractor shall cover all open excavations and shall provide suitable drainage by opening ditches, planting pits, etc., and erect temporary structures where necessary.

C. Grading, soil preparation, and planting work shall be performed only during periods when beneficial and optimum results may be obtained. Excessive soil moisture that would destroy the soil structure, soil spreading, grading, and/or tilling operations shall be suspended until the moisture content reaches acceptable levels and the desired results are attainable. Moisten excessively dry soil that is not workable and which is too dusty before working the soil.

PART 2 - PRODUCTS

2.1 QUALITY

A. All materials shall be of standard, approved, and first grade quality and shall be in prime condition when installed and accepted. All commercially processed and/or packaged materials shall be delivered to the site in the original unopened containers bearing the manufacturer's guaranteed analysis.

2.2 SOIL AMENDMENTS AND FERTILIZERS

A. Soil Conditioner - shall be a product that aids the structure of the soil consisting of rapidly decaying, slowly decaying and non-decaying material. The rate of decomposition of this amendment is very important.

1. The humus material shall have an ash content of no less than 8% and no more than 50%.
2. The pH of the material shall be between 6 and 7.5.
3. The salt content shall be less than 10 millimho/cm @ 25° C. (ECe less than 10) on a saturated paste extract.
4. Boron content of the saturated extract shall be less than 1.0 parts per million.
5. Silicon content (acid-insoluble ash) shall be less than 30%.
6. Calcium carbonate shall not be present if to be applied on alkaline soils.
7. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, sludges, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.
8. Composted wood products are conditionally acceptable (stable humus must be present). Wood based products are not acceptable which are based on redwood or cedar.
9. Sludge-based materials are not acceptable if the soil already has a high level (toxic level) of zinc, copper or other heavy metals based on soil analysis.
10. Carbon:nitrogen ratio is less than 25:1.
11. The compost shall be aerobic without malodorous presence of decomposition products.
12. The maximum particle size shall be 0.5 inch, 80% or more shall pass a No. 4 screen.Maximum total permissible pollutant concentrations in amendment in parts per million on a dry weight basis:
    a. arsenic: 20
    b. cadmium: 15
    c. chromium: 300
    d. cobalt: 50
    e. copper: 150
    f. lead: 200
    g. mercury: 10
    h. molybdenum: 60
    i. nickel: 100
    j. selenium: 50
    k. silver: 10
    l. vanadium: 50
    m. zinc: 300
13. The commercial grade product used shall be Loamex, or approved equal.

B. Agricultural grade gypsum - shall be a (CaSO4 - 2H2O) calcium sulfate product – minimum 92% grade. Ninety-percent (90%) shall pass a 50-mesh screen. Control of dust during application is mandatory. The commercial grade product used shall be U.S. Gypsum, Sof'n'Soil, Dolmar, or approved equal.

C. Sulfur (soil sulfur) - shall be elemental sulfur (99.5%) commercially manufactured so that a pure sulfur product is used. Sulfur is a constituent of three amino acids (cystine, methionne and cysteine) and is essential for protein synthesis. Sulfur is also supplied by gypsum. Sulfur is not effective until it is oxidizes. The bacteria are specific for this and are not common in alkaline soils. The oxidization may require months or years. Gypsum is rapid in its actions. The sulfur used shall be 99.5% elemental. Sizing on stacked screen shall be approximately: 8-mesh 4.3 %; 20-mesh 7.8 %; 50-mesh 46.9 %; I00-mesh 39.3 %; 200-mesh 1.7%. The commercial grade product used shall be Wil-Gro; Union Chemicals, Baker Industries, or approved equal.

D. Iron sulfate - derived from sulfate-deep green (FeSO4, 7H2O), a minimum analysis of iron shall be expressed as metallic is 20.0%. The commercial grade product used shall be Wil-Gro, Bandini, Wilson & Geo. Meyer, or approved equal.

E. Chelated iron shall be Becker Underwood Sprint 138 Fe or other approved equal commercial FeEDDHA for dicots and woody plants, and Becker Underwood Sprint 330 Fe or other commercial FeDTPA for grasses and monocots, or approved equal.

F. Pre-plant starter fertilizer (1-10-10) analysis shall be a commercial grade flowable fertilizer with a 1% nitrogen analysis; 10% phosphorous pentoxide and 10% potassium oxide. No potassium chloride is to be used. Organic nitrogen shall be from cottonseed meal and urea. Phosphorous from superphosphate and cottonseed meal. Potassium (potash) from sulfate of potash and cottonseed meal. Screen analysis 74% to be retained on a 20-mesh screen. 0% to pass a 4-mesh screen, and 2 % to pass a 48-mesh screen. The commercial grade product used shall be Wil-Gro, Gro-Power, Bandini, Kellogg, or approved equal.

G. Prilled post-plant fertilizer (14-7-3) for maintenance - all areas. A maintenance fertilizer shall be used that is granular and homogeneous. Iron and zinc shall be in chelated form and sizing of granules during manufacture is very important. A regular maintenance program using this product for at least the first year is recommended. The homogeneous fertilizer granules used shall contain a fertilizer analysis of 14% nitrogen of which 4% is ammoniac sulfate. Remainder of nitrogen shall be 8.75% water soluble and 1.25% water insoluble. Available phosphorous pentoxide shall be 7%. Potassium oxide shall be 3%. Minor elements shall be chelated 25% by volume consisting of iron 2.0%; zinc 0.15% and manganese 0.15%. By-product calcium shall be 2.0%. Organic nitrogen is derived from urea and cottonseed meal. Phosphate from superphosphate and cottonseed meal. Potash from sulfate of potash and cottonseed meal. No potassium chloride is to be used. Sulfur from sulfate of ammonia. Calcium from superphosphate, iron from ferrous sulfate and mixed sulfides. Zinc and manganese are expressed as metallic and in their elemental form. Screen analysis (% retained) approximately: 4-mesh 1.3%; 8 mesh = 24.2%; 20-mesh = 74.0%; and 48-mesh = 0.05%. The commercial grade product used shall be Wil-Gro Fairway, Gro-Power, Bandini, Kellogg, or approved equal.

H. Planting tablets shall be tightly compressed chip type commercial grade planting tablets, of varying sizes with the following available percentages by weight of plant food:

1. Nitrogen 20.0 % min.
2. Phosphoric acid 10.0% min.
3. Potash 5.0 % min.

4. The commercial grade product used shall be Agriform, Gro-power, or approved equal.

2.3 WETTING AGENT

A. An adjuvant (helping agent) is needed to make water penetrate difficult to wet soils. Also, organic soil amendments are more receptive to increased water holding capacity. Soil water repellence resulting from compaction will be overcome with multiple applications of a soil penetrant in the irrigation water.

B. Product used shall have the following functioning agents: 2- hydroxyethyl ammonium-alkyl benzene sulfonate = 8.77%; alkyl phenoxy poly - (ethylene oxy) ethanol = 4.49%; di (2 hydroxy ethyl)- ammonium cis-9 otadecenoate-octyl alkyldiamide = 2.50 %; dimethyl silicone = 1. 00 %; carrier = 83.24 %. Adjuvant used shall be a commercial grade product and manufactured by Naiad/Wil-Gro, Dow, Dupont, or equal.

2.4 PLANTING BACKFILL FOR TREES AND SHRUBS

A. Planting backfill shall be a thoroughly blended mixture of site soil and soil amendments at the following mixtures:

1.	soil conditioner	0.15 cu.yd.
2.	site soil from excavated planting pit	0.85 cu.yd.
3.	gypsum	10 lbs. per cu.yd. of mix.
4.	iron sulfate	5lbs. per cu.yd. of mix.
5.	pre-plant (1-10-10)	5lbs. per cu.yd. of mix.

2.5 IMPORTED SOIL FOR PLANTER AREAS – IF USED ON THIS PROJECT

A. Definition

1. General - Imported soil shall be from a source outside the limits of the project selected by the Contractor and in compliance with the requirements specified herein. Imported soil shall be screened, fertile, friable soil from well-drained aerated land, and shall be free of roots, clods, heavy clay, pockets of coarse sand, stones larger than one-inch (1″) in the greatest dimension, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid or the like, obnoxious or invasive weeds (such as, but not all inclusive: Quackgrass, Johnsongrass, Poison Ivy, Nutsedge, Nimblewill, Canada Thistle, Bindweed, Bentgrass, Wild Garlic, Ground Ivy, Perennial Sorrel and/or Bromegrass), sticks, lumber, brush, other litter and/or refuse, or any material that might be deleterious to healthy plant growth. Imported soil shall not be infested with nematodes or other undesirable organisms, such as insects and disease-causing plant pathogens. Imported soil shall be friable and have sufficient structure in order to give good tilth and aeration to the soil. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent (15%) when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent (15%) on a dry weight basis. The Construction Manager may make such inspections and perform such tests as deemed necessary to determine that the material meets the requirements.
2. At least 15 days before scheduled use, the proposed source of imported soil must be submitted to the Landscape Architect and Resident Engineer for approval. The Contractor shall submit a written request for approval, which shall be accompanied by a written report from an approved soil-testing laboratory registered by the State of California for agricultural soil evaluation, which states that the proposed source complies with these specifications. Reference paragraph 1.04.B for a listing of approved soil testing laboratories. The imported soil shall meet the following requirements:

B. Gradation limits - Sand, 50-80 percent, clay 20 percent maximum, and silt, 30 percent maximum. Recommendations of sandy loam or loam per USDA definitions. The sand, clay and silt gradation limits shall be as defined by the USDA classification scheme. Gravel over one-quarter-inch (1/4″) in diameter shall be less than ten-percent (10%) by weight.

C. Permeability rate - Hydraulic conductivity rate shall be not less than one inch per hour nor more than 20 inches per hour when tested in accordance with the USDA Handbook Number 60, method 34b or other approved methods. Successful soil can have a permeability rate of 5 to 10 inches per hour.

D. Agricultural suitability - The soil shall be suitable to sustain the growth of the plants specified as per USDA specs.

E. Fertility - The range of the essential elemental concentration in soil shall be as follows: Ammonium Bicarbonate/DTPA Extraction - parts per million (mg/kilogram) - dry weight basis

1.	phosphorus	2 - 40
2.	potassium	40 - 220
3.	iron	2 - 35
4.	manganese	0.3 - 6
5.	zinc	0.6 - 8
6.	copper	0.1 - 5
7.	boron	0.2 - 1
8.	magnesium	50 - 150
9.	sodium	0 - 100
10.	sulfur	25 – 500
11.	molybdenum	0.1 - 30

F. Acidity - The soil pH range measured in the saturation extract (Method 21a, USDA Handbook Number 60) shall be 6.0 - 7.5.

G. Salinity - The salinity range measured in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 0.5 - 2.0 dS/m. If calcium and if sulfate ions both exceed 20 milliequivalents per liter in the saturation extract, the maximum salinity shall be 4.0 dS/m.

H. Chloride - The maximum concentration of soluble chloride in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 150 mg/l (parts per million).

I. Boron - The maximum concentration of soluble boron in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 1 mg/l (parts per million).

J. Sodium Absorption Ratio (SAR) - The maximum SAR shall be 3 measured per Method 20b, USDA Handbook Number 60.

K. Aluminum - Available aluminum measured with the Ammonium Bicarbonate/DTPA Extraction shall be less than 5 parts per million.

L. Soil Organic Matter Content - Sufficient soil organic matter shall be present to impart good physical soil properties but not be excessive to cause toxicity or cause excessive reduction in the volume of soil due to decomposition of organic matter.

M. Calcium Carbonate Content - Free calcium carbonate (limestone) shall not be present.

N. Heavy Metals - The maximum permissible elemental concentration in the soil shall not exceed the following: Ammonium Bicarbonate/DTPA Extraction - parts per million (mg/kilogram) - dry weight basis

1.	arsenic	2
2.	cadmium	2
3.	chromium	10
4.	cobalt	2
5.	lead	30
6.	mercury	1
7.	nickel	5
8.	selenium	3
9.	silver	0.5
10.	vanadium	3

11. If the soil pH is between 6 and 7, the maximum permissible elemental concentration shall be reduced 50%. If the soil pH is less than 6.0, the maximum permissible elemental concentration shall be reduced 75%. No more than three metals shall be present at 50% or more of the above values.

O. Phytotoxic Constituent, Herbicides, Hydrocarbons, etc. - Germination and growth of monocots and dicots shall not be restricted more than 10%. Total petroleum hydrocarbons shall not exceed 100 mg/kg dry soil measured per the modified EPA Method No. 8015. Total aromatic volatile organic hydrocarbons (benzene, toluene, xylene and ethylbenzene) shall not exceed 2 mg/kg dry soil measured per EPA Methods No. 8020.

P. Soil Texture/Organic Matter - Provide information on the soil texture and soil organic matter.

2.6 PLANT MATERIALS

A. Nomenclature: Scientific and common names of plants herein specified shall conform with the approved names given in “Checklist Of Woody Ornamental Plants of California", published by the University of California, College of Agriculture, Manual 32 (1963).

B. Labeling: Each group of plant materials delivered on site shall be clearly labeled as to species and variety. However, final determination of plant species and variety will be made by the Landscape Architect and Resident Engineer and whose decision will be final. All patented plants (cultivars) required by the plant list shall be delivered with a proper plant patent label attached.

C. Quality: Quality of all plants shall conform to the American Nursery & Landscape Association (ANLA) American Standard For Nursery Stock ANSI Z-60. 1-2004 (Approved May 12, 2004). Plants shall be vigorous or normal growth, free from disease, insects, insect eggs, insect larvae, and other pests. Plant materials shall not contain any deleterious, obnoxious, or invasive weeds such as (not all inclusive): Quackgrass, Johnsongrass, Poison Ivy, Nutsedge, Nimblewill, Canada Thistle, Bindweed, Bentgrass, Wild Garlic, Ground Ivy, Perennial Sorrel and/or Bromegrass. All plants shall equal or exceed any measurements specified and shall be supplied from the source indicated when a source is specified.

D. Container-grown stock: Shall have grown in containers for at least six (6) months and through one (1) full growing season, but not over two (2) years. Samples shall be shown to prove that no girdled roots, circled roots, and/or root-bound conditions are present. Any such trees or shrubs shall be deemed as not acceptable. All container plants or trees that have a cracked or broken rootball when taken from the container shall not be planted except on special approval from the Owner's Representative or the Landscape Architect and Resident Engineer.

E. Pruning: At no time shall the plant materials be pruned, trimmed, or topped prior to delivery, and any alteration on the site of their shape shall be conducted only with the approval and in the presence of the Landscape Architect and Resident Engineer.

F. Inspection of plant materials required by city, county, state, and/or federal authorities, and/or other regulatory agencies, shall be the responsibility of the Contractor. When necessary, the Contractor shall have secured permits or certificates prior to delivery of plants at site.

G. Inspection of plant materials: Plants shall be subject to inspection and approval or rejection at the project site at any time before or during progress of work for size, variety, condition, latent defects and injuries. Rejected plants shall be removed from the project site immediately.

H. Rejection and substitution: All plants not conforming to the requirements herein specified and/or as indicated on the drawings shall be considered defective, and such plants, whether in place or not, shall be marked as rejected and be immediately removed from the site of the work and replaced with acceptable plant materials. Under no condition will there be any substitution of plant species, variety, or reduced size for those listed on the accompanying drawings, except with the express written consent of the Landscape Architect and Resident Engineer.

I. Right to changes: The Landscape Architect and Resident Engineer reserves the right to change the plant species, plant variety, and/or sizes of plant material to be furnished, provided that the cost of such plant changes does not exceed the cost of plants in the original bid. The Contractor shall be notified in writing sixty (60) days before the planting operation has commenced. Field changes to the plant species, plant variety, and/or sizes of plant material might be required due to current availability, and shall be coordinated with the Landscape Architect and Resident Engineer. Changes in the size and/or variety of any plant to be furnished which involves a reduction or addition in cost shall be adjusted in the contract cost.

J. Root condition: The Landscape Architect and Resident Engineer reserves the right to inspect root condition of any species, particularly those grown from seed, and if found defective, to reject the plants represented by the defective sample.

K. Protection: All plants at all times shall be handled and stored so that they are adequately protected from drying out, from wind burn, and from all other injury. All plants determined by the Construction Manager or Landscape Architect and Resident Engineer to be wilted, burned, or dried out, may be rejected at any time, whether in the ground or not. All plants shall be handled solely by their containers and all plants that have been handled by the stem or trunk shall be rejected, and removed from the site immediately. The Contractor's on-site plant storage area shall be approved by the Construction Manager prior to the delivery of any plant materials.

L. Specimen tree selection:

1. Electronic photos of each tree variety and size, as called out on the drawings, fifteen (15) gallon size and larger shall be submitted to the Landscape Architect and Resident Engineer for approval prior to delivery to the project site and prior to installation.
2. After delivery to the project site, the Contractor shall immediately remove any trees not approved.
3. The Owner’s Representative at his or her option and at his or her own expense, can retain the services of the Landscape Architect and Resident Engineer to review trees fifteen (15) gallon or larger tagged at the nursery and/or at its place of growth.

2.7 GROUNDCOVER

A. Groundcover plants shall be grown in one (1) gallon pots, four-inch (4″) pots, two-inch (2") pots, flats, or other approved containers, variety and sizes indicated on the planting plan and legend. Flat grown plants (rooted cuttings) shall remain in those flats until transplanting. The soil in the flats shall contain sufficient moisture so that it will not fall apart when lifting the plants. Flat grown plants shall be fully rooted, with top vegetation that is not overgrown in relation to the size of the flat. Plants shall be protected at all times to prevent drying of the root ball.

2.8 EROSION CONTROL MATTING

A. Erosion control matting shall be a fiber mat product composed of 70% wheat straw and 30% mattress grade coconut fiber, mechanically bound and covered on both sides with netting.

B. The bottom netting shall be a lightweight photodegradable polypropylene with mesh openings of approximately three-eights-inch (3/8″) by three-eights-inch (3/8″).

C. The top netting shall be a lightweight photodegradable polypropylene with mesh openings of approximately five-eights-inch (5/8″) by five-eights-inch (5/8″).

D. Typical roll length = one-hundred-and-twenty-feet (120′), typical roll width = seven-and-a-half-feet (7.5′).

E. Product to have a minimum observed functional longevity of one (1) year for non-shredding or decomposition.

F. Erosion control matting shall be Landlok BonTerra CS2, or approved equal.

G. Contractor must supply a sample of product for review as part of submittal prior to ordering and installation.

H. Pins or staples for anchoring matting to the soil shall be in accordance with manufacturer's recommendations.

2.9 FIBER ROLLS

A. Fiber rolls will be composed of biodegradable straw fibers stuffed in a photodegradable open weave netting.

B. Fiber rolls shall be manufactured from rice straw and be wrapped in tubular-type plastic netting.

C. The plastic netting shall have a strand thickness of 0.03 inch, a knot thickness of 0.055, and a weight of 0.35 ounce per foot (each +/- 10%). Plastic netting shall be made from 85% high-density polyethylene, 14% ethyl vinyl acetate, and 1% color for UV inhibition.

D. Fiber rolls shall be nine inches in diameter (+/- one inch), twenty-five feet long (+/- 0.5 feet), and weigh approximately 35 pounds (+/- 10%).

E. Fiber rolls shall be manufactured by California Straw Works, or equal.

F. Contractor must supply a sample of product for review as part of submittal prior to ordering and installation.

G. Stakes shall be fir or pine, and shall be a minimum of one-inch by one-inch by twenty-four inches (1″ x 1″ x 24″) in length. Chromated Copper Arsenate (CCA) treated wood stakes are not acceptable.

2.10 LANDSCAPE BOULDERS

A. Landscape boulders shall be “Desert Select” as supplied by Southwest Boulder & Stone, 5002 2nd Street, Fallbrook, California 92028, (760) 451-3333, or approved equal.

B. Shape: Rounded in character with no sharp edges.

C. Size: Shall be as indicated on the Plans and Drawings.

D. Contractor shall submit photograph of representative samples for review and approval by the Landscape Architect and Resident Engineer prior to ordering and installation.

2.11 RIVER ROCK COBBLE MULCH

A. River rock cobble mulch shall be “Dos Rios”, as supplied by Southwest Boulder & Stone, 5002 2nd Street, Fallbrook, California 92028, (760) 451-3333, or approved equal.

Size: Shall be 2 to 8-inches.

B. Contractor shall submit photographs of representative samples for review and approval by the Landscape Architect and Resident Engineer prior to ordering and installation.

2.12 DECOMPOSED GRANITE

A. D.G. mulch shall be “Southwest Gold”, as supplied by Southwest Boulder & Stone, 5002 2nd Street, Fallbrook, California 92028, (760) 451-3333, or approved equal.

Size: Shall b 3/8” minus.

B. Contractor shall submit photographs of representative samples for review and approval by the Landscape Architect and Resident Engineer prior to ordering and installation.

2.13 TREE STAKING MATERIALS

A. Tree stakes shall be of non-pressure-treated Lodgepole Pine. Chromated Copper Arsenate (CCA) treated wood stakes are not acceptable. Stakes shall have straight shafts, shaved and cut clean, and bare of branches and stubs. Stakes shall be of uniform thickness throughout length, with a minimum diameter of two-inches (2″), free of loose knots, splits, or bends. One end tip shall be tapered to allow ease of installation.

B. Tree ties shall be manufactured of virgin, flexible vinyl meeting ASTM-D-412 standards for tensile and elongation strength. Material shall be black for ultraviolet resistance. Tree ties shall be manufactured with a double-back locking configuration. Tree ties shall be of sizes required to adequately support tree and shall elongate with the tree growth, thus preventing damage to the tree. Tree ties shall be “Cinch Tie,” or approved equal.

2.14 PESTICIDES

A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.15 ROOT BARRIER

A. Root barrier product shall be CP-Series, manufactured by Century Products, or equal.

B. Root barrier shall be black, molded, modular panels manufactured with 50% recycled polyethylene plastic with ultraviolet inhibitors, eighty-five (85) mil. thickness.

C. Each panel shall have vertical root deflecting ribs, protruding out three-quarter-inch (3/4”) height out from panel. Ribs shall be at ninety (90) degree angle to panel (perpendicular to panel length) and shall be spaced at six-inches (6”) apart.

D. Panels shall have an integrated, self-interlocking joining system that slide into each other.

E. Panel width shall be eighteen-inches (18″).

2.16 TREE DRAIN STANDPIPE

A. Contractor shall install a minimum of two (2) tree drain standpipes for 24” box trees or larger. Trees less than 24” box will have a minimum of one tree drain standpipe installed. Standpipes shall be installed to a minimum of 6’ below bottom of root ball.

B. Contractor to refer to construction detail for tree planting, and for actual quantity.

C. Tree drain standpipes shall be four-inch (4″) rigid, perforated PVC pipe wrapped with filter fabric, tied with wire, and topped with a drain grate.

D. Pipe shall be Hancor Dual Wall perforated pipe, or approved equal.

E. Filter fabric at tree drain standpipes shall be non-woven polypropelene with a weight of 4.5 ounces per square yard, grab strength of 120 pounds, tensile elongation of 55%, burst strength of 210 psi, tear strength of 50 pounds, and puncture strength of 70 pounds.

F. Caps for tree standpipes shall be plastic drain grates green in color, and four-inch (4″) in size. Provide flat-type drain grates. Drain grates shall be manufactured by National Diversified Sales (NDS), or equal.

G. Gravel for tree drain standpipes shall be clean, thoroughly washed, crushed rock or gravel, three-quarter-inch (3/4″) in size, and free from sticks, debris, or other deleterious materials.

H. Tree drain standpipe components are to be listed as part of the product submittal and must be approved prior to installation.

2.17 GEOTEXTILE FILTER FABRIC

A. Geotextile filter fabric shall be a nonwoven geotextile composed of polypropylene fibers, formed into a stable network such that fibers retain their relative position.

B. Geotextile filter fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.

C. Geotextile filter fabric shall have the following mechanical and physical properties:

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Grab Tensile Strength	ASTM D 4632	kN (lbs)	0.9 (205)	0.9 (205)
Grab Tensile Elongation	ASTM D 4632	%	50	50
Trapezoid Tear Strength	ASTM D 4533	kN (lbs)	0.36 (80)	0.36 (80)
Mullen Burst Strength	ASTM D 3786	kPa (psi)	2618 (380)	
Puncture Strength	ASTM D 4833	kN (lbs)	0.58 (130)	
Apparent Opening Size (AOS)	ASTM D 4751	mm (U.S. Sieve)	0.180 (80)	
Permittivity	ASTM D 4491	sec^{-1}	1.2	
Permeability	ASTM D 4491	cm/sec	0.21	
Flow Rate	ASTM D 4491	$l/min/m^2$ ($gal/min/ft^2$)	3866 (95)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70	

Physical Properties	Test Method	Unit	Typical Value
Weight	ASTM D 5261	g/m^2 (oz/yd^2)	278 (8.2)
Thickness	ASTM D 5199	mm (mils)	2.3 (90)
Roll Dimensions (width x length)	--	m (ft)	4.5 x 91 (15 x 300)
Roll Area	--	m^2 (yd^2)	418 (500)
Estimated Roll Weight	--	kg (lb)	124 (273)

D. Geotextile filter fabric shall be Mirafi #180N, as manufactured by Mirafi Construction Products, Inc. 365 South Holland Drive, Pendergrass, Georgia 30567, (706) 693-2226, www.tcmirafi.com/products/product_n_index2.html, or equal.

PART 3 - EXECUTION

3.1 SITE REVIEW

A. Examine proposed planting areas and conditions of installation. Do not start planting work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. General: The areas to receive trees, shrubs, groundcovers, sodded turf, seed planting, and other vegetation and their respective requirements for imported soil, fertilizer applications, soil amendments, and other treatments shall be as defined on the drawings. Equipment necessary for preparation of the ground surface and for handling and placing all required material shall be readily available and in proper working condition. Work shall be performed only during periods when beneficial results can be obtained.

B. Clearing and Grubbing: Prior to ripping and tillage operations, all existing vegetation in the area to be planted shall be grubbed, raked, and cleared from the site, unless noted otherwise on the drawings. The subsoil and ground surface shall be cleared of all material which has accumulated during construction activities, and all material which might hinder proper grading, tillage, planting, future plant health, and subsequent maintenance operations. The Contractor shall lawfully dispose of all grubbed materials and debris off the site at his or her expense. The Contractor shall completely remove any masonry, asphaltic concrete, and concrete from planting areas if present, and lawfully dispose of off the site at his or her expense. Do not bury any grubbed materials, debris, masonry, asphatic concrete, concrete, paints, chemicals, or other deleterious substances within any planting area on the project. Completely remove any concrete and plaster slurry/washout from planting areas if present, and remove the soil a minimum depth of 2-inches below the slurry / washout location.

C. Underground Obstructions: All subsurface rocks over 2-inches in diameter and other underground obstructions shall be removed to the depth necessary to permit proper fine grading, tilling, or planting according to plans and specifications, a minimum depth of 6-inches. All abandoned utility lines uncovered or severed shall be cut below grade and capped or plugged with concrete. Explosives shall not be used for removal. When the location of utility lines is shown on the plans or has been made known to the Contractor, all damage to these lines shall be repaired by the Contractor in a manner approved by the Owner's Representative and affected utility purveyor.

D. Deep Ripping: All areas to receive trees, shrubs, groundcover, hydroseeding, and turf shall be deep-ripped and loosened to a depth of 12-inches in all directions. Access roads used during construction activities within planting areas shall be deep-ripped and loosened to a depth of 3 feet in all directions.

3.3 SOIL AMENDMENTS, FERTILIZING, AND ROTOTILLING

A. The following specified soil amendments and fertilizers are guidelines for bidding purposes only. At the time of rough grade, the Contractor shall meet with the Owner's Representative to determine quantity and locations of soil samples to be taken. The soil tests/analysis are the responsibility of the Contractor. The Contractor shall submit soil samples from the site to an approved soil-testing laboratory for agricultural suitability analysis. The Contractor shall submit the results of the soil tests/analysis to the Landscape Architect and Resident Engineer for interpretation and recommendations. If the test results reduce or increase the quantities specified, then the Owner's Representative shall be notified. The contract prices shall be adjusted to reflect any differences between the amendments as specified below and the recommendations of the soil-testing laboratory.

B. After the areas have been deep ripped, the following rates of soil amendment materials shall be evenly spread over all planting areas and shall be thoroughly scarified to an average depth of eight-inches (8″) by rototilling a minimum of two alternating passes. Amendment must be intimately blended with soil.

1.	Soil Conditioner:	4 cu.yd. per 1,000 sq. ft.
2.	Gypsum:	100 lbs. per 1,000 sq. ft.
3.	Soil Sulfur:	20 lbs. per 1,000 sq. ft.
4.	Iron Sulfate:	20 lbs. per 1,000 sq. ft.
5.	Triple superphosphate (0-45-0)	4 pounds per 1,000 sq. ft.
6.	Potassium sulfate (0-0-50)	8 pounds per 1,000 sq. ft.

C. Leaching shall be done prior to the application of soil conditioner, gypsum, soil sulfur, iron sulfate, and pre-plant fertilizer.

D. The wetting agent shall be sprayed on the soil amendments and soil prior to rototilling the amendments into the soil. The rate of application shall be as specified by the manufacturer.

E. The thoroughness and completeness of the rototilling and incorporation of the soil amendments shall be acceptable to the Owner's Representative. Adjust soil amendments and fertilizers on all slopes with gradients of 2:1 and steeper, or as indicated on the drawings.

F. Deep Water Leaching And Follow-Up Soil Testing:

1. After rototilling in soil amendments, the area shall be deep water leached a minimum of three (3) times. Apply water slowly and avoid runoff. Allow the soil to drain thoroughly and partially dry out between applications. The total amount of water applied may be between three to twelve inches (3-12″) depending on the depth and degree of improvement. The soil type (sand, silt, or clay) will determine the amount of time required for the soil to dry out between leaching processes. Do not apply more water if the soil saturation exceeds 50% between applications. Treat and/or remove weeds that germinate.
2. One day after final application of water, the soil shall be tested for content of soluble salts (electrical conductivity or E.C.). The Owner's Representative and the Contractor shall take several soil samples from the top six-inches (6″) of soil or the depth of planting for that particular area, and deliver the samples to an approved laboratory for testing of soluble salts. Reference paragraph 1.07.B for a listing of approved soil testing laboratories. The E.C. test reading shall not be above 3.0 millimho/cm.
3. If soil test reading for E.C. for a particular area tested is above 3.0 millimho/cm, the soil amending, tilling and deep watering procedure shall be repeated until test readings are not above 3.0 millimho/cm.
4. Care shall be taken that the rate of application of water does not cause erosion, sloughing of soils, damage to paving, damage to hardscape elements, or damage to structures. Contractor assumes all responsibility for monitoring of all areas during leaching period.
5. All depressions, voids, erosion scars and settled trenches generated by the deep watering shall be filled with amended soil and brought to finish grade.

3.4 IMPORTED SOIL

A. Subgrades of all planting areas (as noted on the plans to receive imported soil), shall be established at below finish grade in order to accommodate imported soil.

B. The subgrade shall be scarified a minimum depth of two-inches (2″) before placement of the imported soil. Compacted subgrade needs to be ripped. Place two-inches (2″) of import soil and till to four-inches (4″) depth, to form a fifty-fifty (50/50) blend four-inches (4″) in depth to avoid a sharp interface of soil types.

C. Placement: of the imported soil shall be smooth and even in all planting areas. Finish grades in lawn areas shall be 1 inch below adjacent finished paving surfaces and 2 inches in shrub areas without abrupt changes in gradient, not only in the surface of the soil but also where soil meets walks, curbs, pavement or other features, unless otherwise indicated on the drawings.

3.5 SOIL PREPARATION AND FINISH GRADING

A. Rough Grade: Site to be received by Landscape Contractor to within one-tenth-of-a-foot (0.1′), plus or minus, by others based on Civil Engineer's drawings.

B. Finish Grade: Finish grading to consist of grading, raking, watering-in, mechanically compacting and settling to achieve desired contour and flow line patterns resulting in evenly finished surface.

C. All undulations and irregularities in the planting surfaces resulting from tillage, rototilling and all other operations shall be leveled and floated out before planting operations are initiated.

D. Finish grades shall insure positive drainage of the site with all surface drainage away from buildings, walls, over mow curbs, and toward roadways, drains and catch basins. Planting surfaces shall be graded with no less than two-percent (2%) surface slope for positive drainage.

E. The Contractor shall take every precaution to protect and avoid damage to existing sprinkler heads, irrigation lines, and other underground utilities during soil amending and fertilizing operations.

F. All rocks, debris, and other deleterious materials shall be removed from planting areas, and then from the site. Rocks in accordance with the following criteria: one-half-inch (1/2″) diameter in hydroseed areas; 1-inch diameter in turf areas and groundcover areas; and 2-inches diameter in shrub areas a minimum depth of 6-inches. Remove gravel over three-eighths-inch (3/8″) from the top 2-inchesin turf areas.

G. Final finish grade shall be 1-inch below finish paving surface in adjacent lawn areas and 2-inches in shrub areas, and decomposed granite areas. Final grades shall be acceptable to the Owner's Representative before planting operations will be allowed to begin.

H. Ease top and toe of all existing slopes.

3.6 PLANTING INSTALLATION - GENERAL

A. Timing: Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally acceptable practice.

B. Layout of trees: All trees 24" box size and larger (including any specimen bare-root palms) shall be placed in the landscape per the direction of the Landscape Architect and Resident Engineer prior to installation of irrigation system. The trees shall then be moved so that planting holes can be excavated and amended. The trees shall then be installed in their respective holes and positioned in the holes per direction of the Landscape Architect and Resident Engineer. For those trees located within tree grates, the layout shall be in direct coordination with the installation of the tree grates. The trees shall be placed so that the center of trunk is directly within the center of the tree grate, equidistant on all sides of the tree grate cutout.

C. Layout of planting: Locations shall be approved by the Landscape Architect and Resident Engineer. All container plants shall be set by the Contractor in their final location in their respective containers prior to digging holes and/or planting. All plant locations shall be checked for possible interference with existing underground utility lines.

D. Backfill for trees and shrubs: shall be as specified in this section. If artificial drainage is requested, then drains shall be installed first, then backfilled with soil.

E. Disposal of excess soil and debris - all excess excavated subsoil, rocks and debris shall be legally disposed off the site by the Contractor at his or her cost or utilized on the site as directed by and at the option of the Owner. Use the more suitable soil excavated from the planting pit, and dispose the less suitable soil. Do not place unamended soil over amended soil.

3.7 EXCAVATION FOR PLANT MATERIALS

A. Revise size and cross section of tree and shrub planting pits and trenches in first paragraph below to suit Project. As planting practices have evolved, pit and trench proportions have changed; they are wide at top with sides tapered to a narrow base and are as deep or almost as deep as root ball that is to be set on an undisturbed subgrade. Revise descriptions if required and supplement with drawing details.

B. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

1. Excavate approximately 2 times as wide as ball diameter for boxed and container-grown stock.
2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
4. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
5. Excavation shall include the stripping and stacking of all acceptable soil encountered within the areas to be excavated for plant pits and planting beds. Protect all areas that are to be trucked over and upon which soil is to be temporarily stacked pending its re-use for the filling of holes, pits, and beds.
6. Maintain supervision of excavations during working hours.
7. Keep excavations covered or otherwise protected when unattended by Installer's personnel.

C. Subsoil and topsoil removed from excavations may be used as planting soil.

D. Obstructions: Notify Landscape Architect and Resident Engineer if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch diameter holes, 24-inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

E. Drainage: Notify Architect and Resident Engineer if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

F. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.8 PLANTING TREES, SHRUBS, ORNAMENTAL GRASSES, AND VINES

A. Soil moisture level in planting areas at time of planting shall be no less than horticulturally acceptable. The Contractor shall request approval of moisture, and if found to be insufficient for planting, the planting pits shall be filled with water and allowed to drain before starting any planting operations.

B. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

C. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

D. Set container-grown stock plumb and in center of excavated planting pit or trench with root flare 1-inch above adjacent finish grades.

1. Carefully remove root ball from container without damaging root ball or plant.
2. Use planting soil with the heretofore specified amendments for backfill.

3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Do not cover the top of the rootball with backfill soil, which might create soil interface conflicts and inhibit aeration and gaseous exchange.
5. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended below. Place tablets beside the root ball about 1-inch from root tips; do not place tablets in bottom of the hole. See below for application rates.
6. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

F. Create rootball drainage for all boxed trees by removing the bottom of the box before planting, or cutting drainage holes in the bottom of the box, or separating the boards on the bottom after planting, or other approved method.

G. The Contractor shall be responsible for all surface and subsurface drainage required which may affect his / her guarantee of the trees, shrubs, ornamental grasses, and vines.

H. Planting tablets shall be placed in each planting hole at the following rates and per the manufacturer's recommendations (soil reports from soil-testing laboratory supercede application rates in this section, if different):
1. One 5-gram tablet per individual liner and flat size plant.
2. One 21-gram tablet per 1 gallon container.
3. Three 21-gram tablets per 5 gallon container.
4. Four 21-gram tablets per 15 gallon container.
5. One 21-gram tablet per each 4-inch of box size.
6. Random testing to verify planting tablet installation shall be conducted by the Owner.

I. Tree trunks shall be set vertical and plumb, unless otherwise noted on the drawings or at the direction of the Landscape Architect and Resident Engineer.

J. Immediately after planting, install a soil berm around the perimeter of each planting pit to create an enclosed water basin, except in turf locations. The height of the soil berm shall be 4-inches for trees and 3-inches for shrubs. All plants shall be thoroughly watered to the full depth of each planting hole. If water slowly moves into the rootball from the backfill soil, dual berms may be needed. One over the rootball and another one at the edge of the backfill so that each one can be separately irrigated. Drip irrigation can be used to irrigate difficult rootballs.

K. Staking and tying: All trees and any other plants indicated on the plans shall be staked per detail. Stakes shall be driven into the ground of the windward side of the tree. The stakes shall be driven in plumb and secure. Special care shall be taken that the driving in of the stake does not damage the tree bark, tree roots or root ball. Tree ties shall be wrapped around the tree trunk and the stake, twisting to form a figure-eight. The tree ties shall be long enough to provide for 3-inches of slack to permit the tree trunk limited movement in any direction. Secure the tree tie with the double-back locking configuration. Secure each tree tie with one galvanized nail driven through the tree tie and into the stake to prevent slippage (see Drawings). The staking shall be accomplished by the Contractor in such a manner as to ensure the proper and healthy growth and the safety of the plants, property, and the public.

L. Pruning after planting shall be required on all trees, shrubs, and vines when necessary to provide the specified or approved standard shapes, form and/or sizes characteristic to each plant. Pruning shall be required when necessary to provide horizontal and/or vertical sight line clearance. Pruning may include thinning and/or cutting and shall be under the direction of the Landscape Architect and Resident Engineer. Pruning cuts shall not be painted with tree sealants.

3.9 PLANTING GROUNDCOVER

A. Groundcovers shall be planted in the areas indicated on the plans, and shall be installed only after all debris and surface rocks 1-inch diameter and larger have been removed from the planting area.

B. If the top 4-inches of soil in the area to be planted in groundcover is not sufficiently moist (horticulturally acceptable standards), the area shall be thoroughly irrigated and no less than 12 hours shall pass before planting.

C. Groundcovers shall be planted in even, triangularly spaced rows, at the intervals called out for in the legend on the drawings, unless otherwise noted.

D. The size of planting excavation for groundcover shall be at least twice the width of the root ball.

E. For rooted cutting plants supplied in flats, each plant shall be planted in a manner that will ensure minimum disturbance of the root system, but in no case shall this depth be less than two (2) nodes.

F. Each groundcover plant shall be planted with one 5-gram planting tablet incorporated into the root zone. Planting area shall be hand-smoothed after planting to provide an even and smooth final finished grade. To avoid drying out and damaging groundcover, plants must be irrigated after planting. This may be done manually or by using the installed irrigation system. Repeated applications may be required, especially on a sloping site. This initial irrigation procedure shall continue until the soil profile is thoroughly moistened to field capacity a minimum depth of twice the depth of each planting hole.

3.10 LANDSCAPE BOULDERS

A. Landscape boulders shall be installed within the project, at locations as shown on the plans and drawings.

B. The burial depth of the boulders shall be approximately one-third (1/3) of the overall vertical dimension of each boulder to achieve a natural character in appearance.

C. Contractor shall coordinate final placement and installation with the Landscape Architect and Resident Engineer and Owner's Representative.

3.11 RIVER ROCK COBBLE MULCH

A. River rock cobble mulch shall be installed within the project, at locations indicated on the Plans and Drawings.

B. Install river rock cobble over soil separator fabric, as shown on the details of the Plans & Drawings.

C. Install river rock cobble mulch at such uniform depth that one-hundred-percent (100%) of the soil separator fabric [and/or soil] is covered in those areas where river rock cobble is to be installed.

D. Contractor shall coordinate final placement and installation with the Landscape Architect and Resident Engineer and Owner's Representative.

3.12 PESTICIDE APPLICATIONS

A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations.

B. Coordinate applications with Owner's operations and others in proximity to the Work.

C. Notify Owner before each application is performed.

D. No restricted pesticides shall be used.

E. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and groundcover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.

F. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.13 ROOT BARRIER

A. Install root barrier as per manufacturer's recommendations.

B. Root barrier shall be installed where trees are planted within five-feet (5′) of paving or other hardscape elements (such as walls, curbs, walkways, etc.).

C. Root barrier shall be aligned vertically and run in a linear fashion, along and directly adjacent to paving or other hardscape elements to be protected.

D. Install root barrier along the edge of paving or hardscape element for a distance of ten-feet (10′) in each direction from the tree trunk, for a total of twenty-feet (20′) per affected tree. Where trees are closer than ten-feet (10′) apart, a single continuous piece of root barrier shall be used.

E. Root barrier shall not surround root ball of tree at any time.

F. Tops of root barriers are to be flush with finish grade of soil, with no portion visible above finish grade.

G. Do not distort or bend root barrier during construction activities.

H. Overlap root barrier a minimum of 12-inches at splices.

3.14 TREE DRAIN STANDPIPE

A. Install tree drain standpipes as per construction detail at all trees, on directly opposite sides of the tree root ball.

B. Ensure that standpipes are installed at the depth shown on the construction detail.

C. Standpipe hole below tree rootball shall be augered to a twelve-inch (12") width minimum.

D. Stand pipes shall be set vertical (plumb) in the augered hole.

E. Wrap standpipes with filter fabric.

F. Backfill hole around standpipe below tree rootball with gravel. Do not fill standpipe with gravel.

G. Cap standpipe with plastic drain grate. Install atrium-type drain grates for shrub and groundcover areas, and install flat-type drain grates for turf areas.

H. Top of installed cap shall be at finish grade in turf areas and two-inches (2") above finish grade in bark mulch areas.

3.15 CLEAN-UP AND SAFE ENVIRONMENT

A. As project progresses, Contractor shall maintain all areas in a neat and safe manner, and remove unsightly debris as necessary. After completion of project each day, Contractor shall remove all debris and containers used in accomplishing work. Contractor shall sweep and clean all sidewalks, asphalt, and concrete areas adjacent to plantings. Contractor shall be responsible for disposing of, off site, at no additional expense, any trash or debris generated by the installation of the work.

3.16 GENERAL MAINTENANCE AND THE MAINTENANCE PERIOD

A. General maintenance operations shall begin immediately after each plant is planted. The general maintenance shall include the following:

1. Keeping the plants in a healthy, growing condition by watering, fertilizing, pruning, spraying, weeding and all other necessary operations of maintenance. All paving and walks shall be kept clear, clean and washed down.
2. Protection: The Contractor shall be responsible for providing adequate protection of all planting areas against traffic or other use by erecting fencing or other acceptable means immediately after the planting is completed. Warning signs and barricades shall be placed in various high traffic areas. Damaged areas shall be repaired immediately by the Contractor.
3. Weeding and cultivating: All tree, shrub, groundcover, vine, turf, and hydroseeded areas shall be kept free of weeds, noxious grasses, rocks over 1-inch in diameter, clods, trash and debris on a weekly basis. Groundcover and shrub areas shall be cultivated at intervals of not more than 14 days minimum.
4. Replacement: During the Maintenance Period, plants which die or which are in an unhealthy or badly impaired condition shall be replaced by the contractor within 14 days after unsatisfactory condition is evident. No replacement of plantings shall be made in any season definitely unfavorable for planting. At the conclusion of the Maintenance Period, the Landscape Architect and Resident Engineer will make an inspection of the work to determine the condition of all plants. All unhealthy plants shall be removed from the site and replaced with plants of the same kinds and sizes as originally specified. Such replacement shall be made in the same manner as specified for the original planting and at no extra cost to the Owner.
5. Fertilization:
    a. Trees - post fertilization shall occur at 100-day intervals after planting. Apply fertilizer at the rate of 1-lb. per 1-inch caliper of tree trunk diameter at breast height. Fertilizer shall be 14-7-3 or approved equal.
    b. Shrubs - post fertilization shall occur 60 days after planting and apply fertilizer at the rate of 1 teaspoon per each one-gallon plant and 1 tablespoon per five-gallon plant. Fertilizer shall be 14-7-3, or approved equal.
    c. Groundcover and lawn areas - post fertilization shall occur 60 days after planting and apply fertilizer at the rate of 7-lbs per 1,000 square feet. Fertilizer shall be 14-7-3, or approved equal.

B. Maintenance Period: The Maintenance Period shall begin on the first day after the pre-maintenance observation acceptance and shall continue thereafter for no less than 90 continuous calendar days. If any plants are replaced during the Maintenance Period, then the 90-day Maintenance Period for those plants shall begin at the date of installation for that plant, if so directed by the Landscape Architect and Resident Engineer or the Owner.

C. Extended Maintenance Period: When, in the opinion of the Landscape Architect and Resident Engineer, there is improper maintenance, and/or poor condition of plant materials, and/or unhealthy condition of plant materials, then the Contractor shall be responsible for additional maintenance of the work at no additional cost to the contract until all work is acceptable by the Landscape Architect and Resident Engineer.

END OF SECTION

SUPPLEMENTARY SPECIAL PROVISIONS

APPENDICES

APPENDIX A

PERMANENT AND TEMPORARY FIRE STATION 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.: WBS # S-00783

PROJECT TITLE: Fire Station No. 17 Project

PROJECT LOCATION-SPECIFIC: The project is located at 4206 Chamoune Avenue in the City Heights Community.

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

DESCRIPTION OF NATURE AND PURPOSE OF THE PROJECT: The project will demolish the existing fire station and replace it with a new, three story, 10,757 square foot fire station and associated improvements to meet the current Fire Department needs for this community. The existing structure has been reviewed by the Historical Resources Board staff and determined not to be eligible for historic designation. The new building will meet the requirements for a LEED Silver certified building. Other improvements include new fencing, landscaping, and mechanical equipment.

NAME OF PUBLIC AGENCY APPROVING PROJECT: City of San Diego

NAME OF PERSON OR AGENCY CARRYING OUT PROJECT: City of San Diego, E&CP Dept/Yousef Ibrahim
600 B Street, Suite 800 (MS 908A)
San Diego, CA 92101
(619) 235-1965

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 (REPLACEMENT OR RECONSTRUCTION)

REASONS WHY PROJECT IS EXEMPT: The City of San Diego has determined the project meets the categorical exemption criteria set forth in the CEQA State Guidelines, Section 15302 (Replacement or Reconstruction) which allows for replacement or reconstruction 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. No environmental impacts were identified for the proposed project. Additionally, none of the exceptions described in CEQA Guidelines Section 15300.2 apply.

LEAD AGENCY CONTACT PERSON: ANNA L. MCPHERSON

TELEPHONE: (619) 446-5276

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

Anna L. McPherson

SIGNATURE/TITLE

06/27/2012

DATE

CHECK ONE:
(X) SIGNED BY LEAD AGENCY

DATE RECEIVED FOR FILING WITH COUNTY CLERK OR OPR:

NOTICE OF EXEMPTION

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.: S-00783.02.06

PROJECT TITLE: FIRE STATION 17- TEMPORARY FACILITY

PROJECT LOCATION-SPECIFIC: The project is located on a paved parcel west of 41st Street and north of University Avenue within the Mid-City, City Heights community planning area. (Council District 9).

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

DESCRIPTION OF NATURE AND PURPOSE OF THE PROJECT: The project will provide a temporary fire station facility for use while a new Fire Station 17 facility is constructed. The temporary facility will include a state approved 1,440-square-foot coach and 1,350-square-foot apparatus structure as well as staff parking and other improvements to serve the facility including utility connections new communications, mechanical and electrical equipment.

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: Rowaida Jadan
525 B Street, Suite 750 (MS 908A)
San Diego, CA 92101
(619) 533-6655

EXEMPT STATUS:

( ) 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: 15301EXISTING FACILITIES AND 15303 NEW CONSTRUCTION OR CONVERSION OF SMALL STRUCTURES

REASONS WHY PROJECT IS EXEMPT: The City of San Diego conducted an environmental review which determined that this project meets the categorical exemption criteria set forth in CEQA State Guidelines, Section 15301, Existing Facilities, which allows for minor repair or alteration of existing facilities involving no or negligible expansion of use. This project includes only temporary structures and other minor site improvements to a previously developed site. The project also meets criteria set forth in CEQA State Guidelines Section 15303, New Construction or Conversion of Small Structures which allows for the construction of a limited number small structures and equipment and the exceptions listed in CEQA Section 15300.2 would not apply.

LEAD AGENCY CONTACT PERSON: M. BLAKE

TELEPHONE: 619-446-5375

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

SIGNATURE/SENIOR PLANNER

August 15, 2014
DATE

CHECK ONE:

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

DATE RECEIVED FOR FILING WITH COUNTY CLERK OR 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 1 OF 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

Application for Fire Hydrant Meter (EXHIBIT A)

City of San Diego PUBLIC UTILITIES Water & Wastewater

(For Office Use Only)

NS REQ	FAC#
DATE	BY

METER SHOP (619) 527-7449

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 FIRE STATION, GEOTECHNICAL REPORTS

November 6, 2012
Project No. 107275001

Mr. Darrold Davis
CCBG Architects
3677 Voltaire Street
San Diego, California 92106

Subject: Subgrade Preparation and Base Course Thickness for Permeable Paving Areas
Fire Station No. 17 Replacement
4206 Chamoune Avenue
San Diego, California

Reference: Ninyo & Moore, 2012, Geotechnical Evaluation, Fire Station No. 17 Replacement, 4206 Chamoune Avenue, San Diego, California: dated March 23.

Dear Mr. Davis:

As requested by you, we have prepared this letter to provide our recommendations for subgrade preparation and base course thickness for proposed permeable paving areas (Drivable Grass® or Aqua Roc®). It is our understanding that these products would be utilized on the western portion of the project site.

As mentioned in the referenced geotechnical report for the project (Ninyo & Moore, 2012), the onsite fill material was evaluated to have an R-value of less than 5. We anticipate the fill material will be removed as recommend in our report. The base course thickness was evaluated based on an assumed subgrade R-value of 20 for import fill materials. 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 presented in the referenced report, a Traffic Index (TI) of 8.0 was assumed for design. The TI should be checked by the civil engineer based on anticipated traffic loads. If TI is different from that assumed, the pavement design should be re-evaluated. We assumed the Drivable Grass® and Aqua Roc® products to be equivalent to approximately 1.5 inches and 2.5 inches thick asphalt concrete, respectively. The base course thickness was calculated in accordance with general engineering practices. Based on these calculations, we recommend a base course thickness of 20 inches and 18 inches under Drivable Grass® and Aqua Roc® products, respectively.

The upper 12 inches of subgrade should be scarified, moisture conditioned to near optimum moisture content requirements, and compacted to 95 percent relative compaction based on the ASTM International (ASTM) Test Method D 1557. The compacted surface should be smooth and non-yielding prior to placement of base material. Soft or spongy areas should be removed and replaced with compacted fill material or base material.

Base course should conform to Caltrans Class 2 Permeable Aggregate Base material. These materials should be moisture conditioned to near optimum moisture content and then compacted to 95 percent relative compaction based on the ASTM Test Method D 1557.

As noted in our referenced geotechnical report, very old paralic deposits were encountered at a depth of approximately 2 feet below the existing ground surface. Even though infiltration testing was not conducted at the site, it is our opinion that the very old paralic deposits have poor infiltration capacity. Designers evaluating the infiltration rates and storage capacity of Drivable Grass® and Aqua Roc® systems for the project should consider the infiltration rate in very old paralic deposits to be very low to impervious (similar to clayey soils). Sub-drains should be installed in the base course, if high infiltration rates are required for the project. Sub-drains should be connected to an appropriate outlet.

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, Jr., 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

LIMITED GEOTECHNICAL EVALUATION
TEMPORARY FIRE STATION NO. 17
UNIVERSITY AVENUE AND 41ST STREET
SAN DIEGO, CALIFORNIA

PREPARED FOR:
CCBG Architects
3677 Voltaire Street
San Diego, California 92106

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

November 6, 2012
Project No. 107275001

November 6, 2012
Project No. 107275001

Mr. Darrold Davis
CCBG Architects
3677 Voltaire Street
San Diego, California 92106

Subject: Limited Geotechnical Evaluation
Temporary Fire Station No. 17
University Avenue and 41st Street
San Diego, California

Dear Mr. Davis:

In accordance with your authorization, we have performed a limited geotechnical evaluation for the proposed Temporary Fire Station No. 17 in San Diego, California. This is a reconnaissance-level geotechnical evaluation and drilling was not performed for the project per the contract. This report presents our geotechnical findings and conclusions regarding the proposed project. 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, Jr., PE
Principal Engineer

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

Jonathan Goodmacher, PG, CEG
Principal Geologist

MAC/KHM/JG/gg

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

PROFESSIONAL GEOLOGIST
JONATHAN C. GOODMACHER
Exp. 10/31/13
No. 2136
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

TABLE OF CONTENTS

1. INTRODUCTION

In accordance with your request, we have performed a limited geotechnical evaluation for the proposed Temporary Fire Station No. 17. The project site is located northwest of the intersection of University Avenue and 41st Street in the city of San Diego, California (Figure 1). This report presents our conclusions regarding the geotechnical conditions at the site and our recommendations for the design and construction of this project. It should be noted that the findings, conclusions, and recommendations presented are based on site reconnaissance and background research and without the benefit of subsurface exploration. A geotechnical report for the permanent Fire Station 17 was previously submitted (Ninyo & Moore, 2012).

2. SCOPE OF SERVICES

Ninyo & Moore's scope of services for this project included review of pertinent background data, performance of a geologic reconnaissance, and engineering analysis with regard to the proposed project. Specifically, we performed the following tasks:

- Reviewing background information including available geotechnical reports, topographic maps, geologic data, fault maps, aerial photographs, and provided site information.
- Performing a geologic reconnaissance of the site and the evaluation of possible geologic hazards which may impact the proposed project.
- Compiling and analyzing the data obtained from our background and reconnaissance activities.
- Preparing this report presenting our findings, conclusions, and recommendations.

3. PROJECT AND SITE DESCRIPTION

The proposed temporary fire station site is currently vacant and fenced. There is an existing school building on the north, University Avenue on the south, 41st Street on the east, and a walkway on the west. The site is relatively flat, with a gentle slope to the west. The site coordinates are approximately 32.7499°N latitude and -117.1076°W longitude. The ground elevation is approximately 360 feet above mean sea level (MSL).

Proposed construction at the site includes living quarters, a sprung structure for apparatus, at-grade asphalt-paved parking lot, and concrete driveway and walkway. The new living quarters will be a pre-fabricated modular trailer supported on a concrete or wooden pad foundation. The new sprung structure for apparatus will consist of fabric walls and steel frame supported on metal plates anchored to the ground.

4. GEOLOGIC CONDITIONS

Our findings regarding regional and site geology and groundwater conditions at the site are provided below. As noted, this information is based on the findings from our background review and geologic reconnaissance and was prepared without the benefit of subsurface exploration. Figures 2 and 3 are regional geology and fault location maps.

4.1. 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.

The Peninsular Ranges Province is traversed by a group of sub-parallel faults and fault zones trending approximately northwest. Several of these faults (Figure 3) 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 4 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.

4.2. Site Geology

Geologic units observed during our reconnaissance and mapped at the site included fill and very old paralic deposits (Kennedy and Tan, 2008). Generalized descriptions of the units anticipated at the site are provided below.

4.2.1. Fill

Although not mapped, based on our site reconnaissance, the site is underlain by fill soils. The depth of fill soils is unknown. In addition, the composition of the fills is unknown as no documentation on the placement was made available.

4.2.2. Very Old Paralic Deposits ($Qvop_8$)

Quaternary-age very old paralic deposits, formerly referred to as the Lindavista Formation, are anticipated 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.

4.3. Groundwater

Surface groundwater seepage was not observed during our reconnaissance of the site. Based on research performed for an assessment of a nearby site, groundwater in the project area is anticipated to be deeper than 90 feet below the ground surface (Ninyo & Moore, 2012). Fluctuations in the groundwater level may occur due to variations in ground surface topography, subsurface geologic conditions and structure, rainfall, irrigation, and other factors.

5. GEOLOGIC HAZARDS

In general, hazards associated with seismic activity include ground surface rupture, strong ground motion, and liquefaction. These considerations and other geologic hazards such as landsliding are discussed in the following sections.

5.1. 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 4 miles west of the site. It is noted that north-trending fault zones are mapped about 1.5 miles of the project site (City of San Diego, 2008; Kennedy and Tan, 2008). These faults are associated with the La Nacion fault zone; which is not mapped as active by the State of California. The La Nacion fault zone does not exhibit geomorphic features commonly associated with recent faulting (Elliot and Hart, 1977). Additionally, radiocarbon dates of unfaulted alluvium overlying the fault range from approximately 7,000 years (Hart, 1974) to in excess of 10,500 years (Elliot and Hart, 1977). We consider the seismic parameters associated with the closest known active fault, the Rose Canyon fault, appropriate for design purposes.

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.

5.1.1. Strong Ground Motion

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 0.52g using the United States Geological Survey (USGS) (USGS, 2011) ground motion calculator (web-based). The design PGA was 0.34g 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.

5.1.2. 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.

5.1.3. 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 very old paralic deposits and anticipated absence of a shallow groundwater table, it is our opinion that liquefaction and seismically induced settlement at the subject site are not design considerations.

5.1.4. 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.

5.2. 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.

5.3. 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 52 (Figure 4). Hazard Category 52 is characterized by areas of gently sloping to steep terrain with favorable geologic structure that possess low risk.

6. CONCLUSIONS

Based on our review of the referenced background data and geologic field reconnaissance, it is our opinion that construction of the proposed temporary project is feasible from a geotechnical stand-point 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 and very old paralic deposits.
- Groundwater is not anticipated to be a design consideration. However, perched zones and seepage could be encountered.
- 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 4 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.

7. RECOMMENDATIONS

Based on our understanding of the project, the following recommendations are provided for the design and construction of the proposed temporary fire station and improvements. The proposed site improvement should be constructed in accordance with the requirements of the applicable governing agencies. Based on our discussion with the representatives of CCBG Architects, we understand that the foundation design and pad preparation will be provided by the contractor.

7.1. Seismic Design Parameters

The proposed improvements should be designed 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 CBC (2010) guidelines and mapped spectral acceleration parameters (United States Geological Survey [USGS], 2011).

Table 1 – 2010 California Building Code Seismic Design Criteria

Factors	Values
Site Class	D
Site Coefficient, F_a	1.00
Site Coefficient, F_v	1.53
Mapped Short Period Spectral Acceleration, S_S	1.29 g
Mapped One-Second Period Spectral Acceleration, S_1	0.48 g
Short Period Spectral Acceleration Adjusted For Site Class, S_{MS}	1.29 g
One-Second Period Spectral Acceleration Adjusted For Site Class, S_{M1}	0.72 g
Design Short Period Spectral Acceleration, S_{DS}	0.86 g
Design One-Second Period Spectral Acceleration, S_{D1}	0.48 g

7.2. Flexible Pavement Design

Laboratory R-value testing of on-site soils was not performed for the project. Our preliminary flexible pavement design is based on an assumed R-value of 20. 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.

Based on our discussions with the designers, we understand that the parking lot will consist of decomposed granite (DG), except for ADA parking, which will consist of asphalt concrete. We understand that traffic in the parking lot and drive aisle will consist primarily of automobiles and light trucks. Trash trucks and fire engines are not anticipated to access these areas. Rigid pavement recommendations for trash trucks and fire engines are provided in the following section. For design we have assumed Traffic Indices (TI) of 5.0 and 6.0 for site pavements after discussing with the designers. The preliminary recommended pavement sec-

tions are presented in Table 2. However, we recommend that we re-evaluate the pavement design, based on the R-value of the subgrade material exposed at the time of construction.

Table 2 – Recommended Preliminary Pavement Sections

Traffic Index	R-Value	Decomposed Granite (in)	Asphalt Concrete (in)	Class 2 Aggregate Base (in)
5.0	20	N/A	3.0	7.0
6.0	20	N/A	3.5	9.5
6.0	20	4.0	N/A	12.0

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 indices are different from those assumed, the pavement design should be re-evaluated.

7.3. 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. Based on our discussions with the representatives of CCBG Architects, we understand that for rigid pavements, 6 inches of 600 psi flexural strength and 4,000 psi compressive strength Portland cement concrete reinforced with No. 4 bars each way, will be used. We recommend that the geotechnical consultant re-evaluate the pavement design, based on the subgrade material exposed at the time of construction.

7.4. Plan Review and Construction Observation

The conclusions and recommendations presented in this report are based on our review of the referenced background data and geologic field reconnaissance. 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. We recommend subsurface exploration be performed at the site if additional recommendations are needed. 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.

8. LIMITATIONS

The field evaluation 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 subsurface exploration. Subsurface evaluations were not performed but can 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.

9. REFERENCES

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AERIAL PHOTOGRAPHS				
Source	**Date**	**Flight**	**Numbers**	**Scale**
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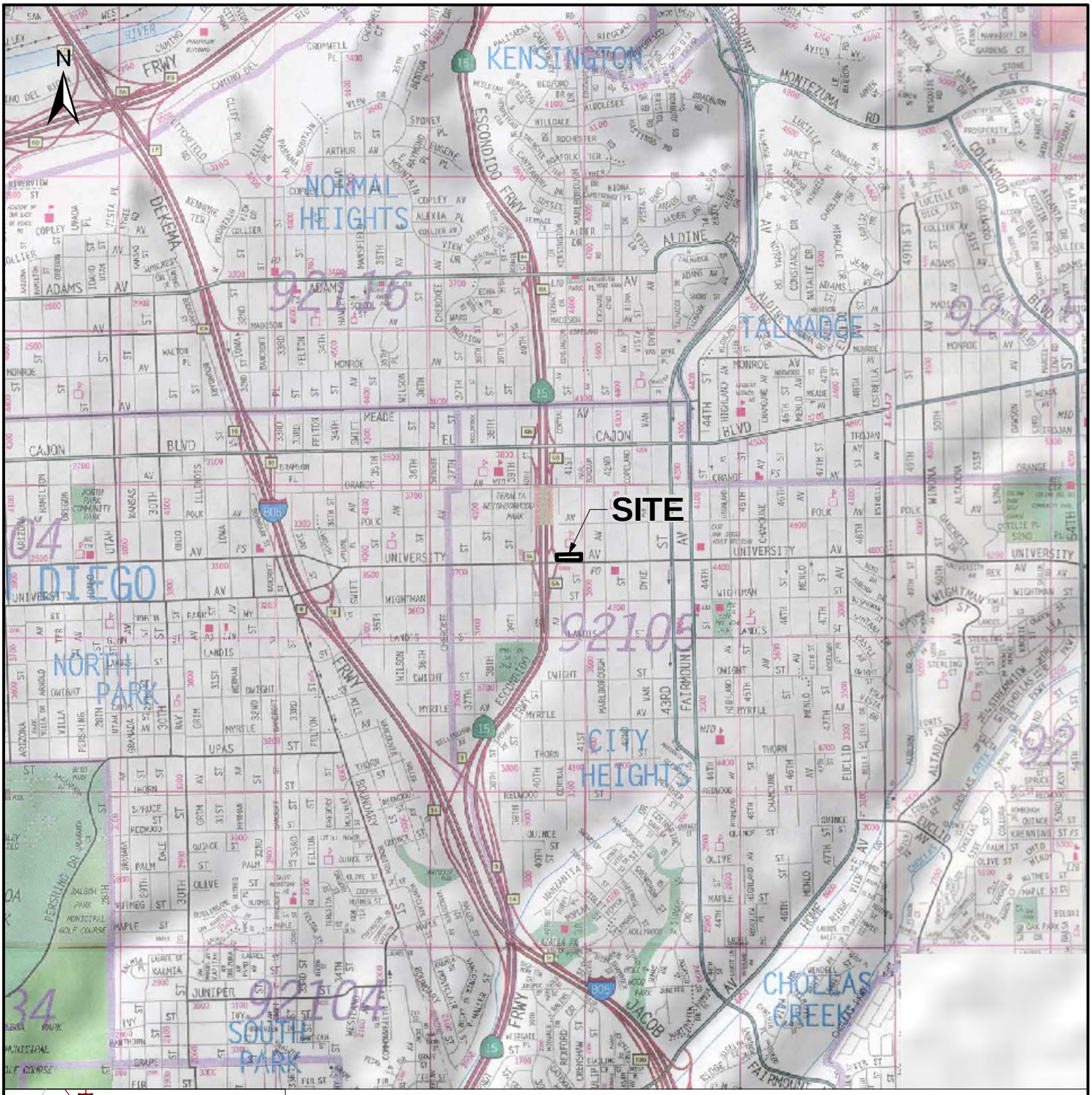
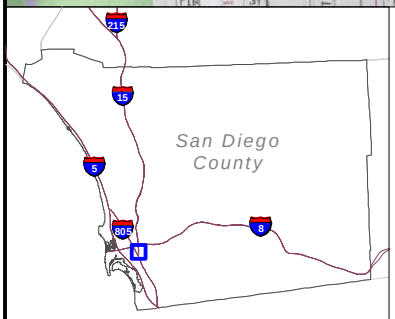


SOURCE: 2008 Thomas Guide for San Diego County, Street Guide and Directory; Map © Rand McNally, R.L.07-S-129



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. 107275001 / DATE 11/12	TEMPORARY FIRE STATION NO. 17 UNIVERSITY AVENUE AND 41ST STREET SAN DIEGO, CALIFORNIA	1

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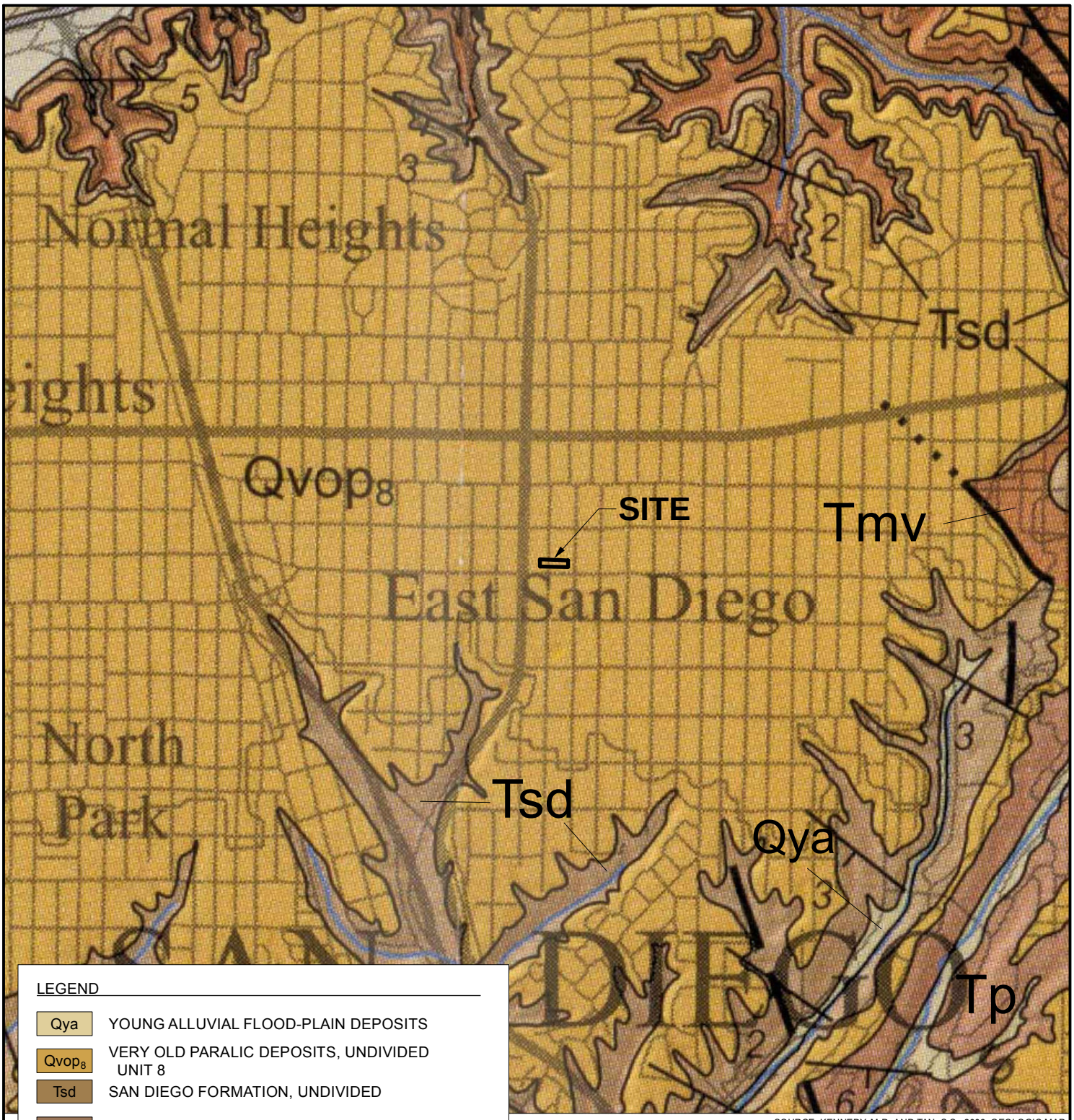

LEGEND

Qya	YOUNG ALLUVIAL FLOOD-PLAIN DEPOSITS
$Qvop_8$	VERY OLD PARALIC DEPOSITS, UNDIVIDED UNIT 8
Tsd	SAN DIEGO FORMATION, UNDIVIDED
Tp	POMERADO CONGLOMERATE
Tmv	MISSION VALLEY FORMATION
3	STRIKE AND DIP OF BEDS, INCLINED
U / D	FAULT - SOLID WHERE ACCURATELY LOCATED, DASHED WHERE APPROXIMATELY LOCATED. WHERE AGE WAS DETERMINED, AGE SYMBOL IS SHOWN ASTRIDE FAULT AND RELATIVE OFFSET, IF KNOWN, IS SHOWN BY "D" AND "U" ON DOWNTHROWN AND UPTHROWN SIDES.

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

N

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	GEOLOGY	FIGURE
PROJECT NO. / DATE	TEMPORARY FIRE STATION NO. 17 UNIVERSITY AVENUE AND 41ST STREET SAN DIEGO, CALIFORNIA	2
107275001 / 11/12		

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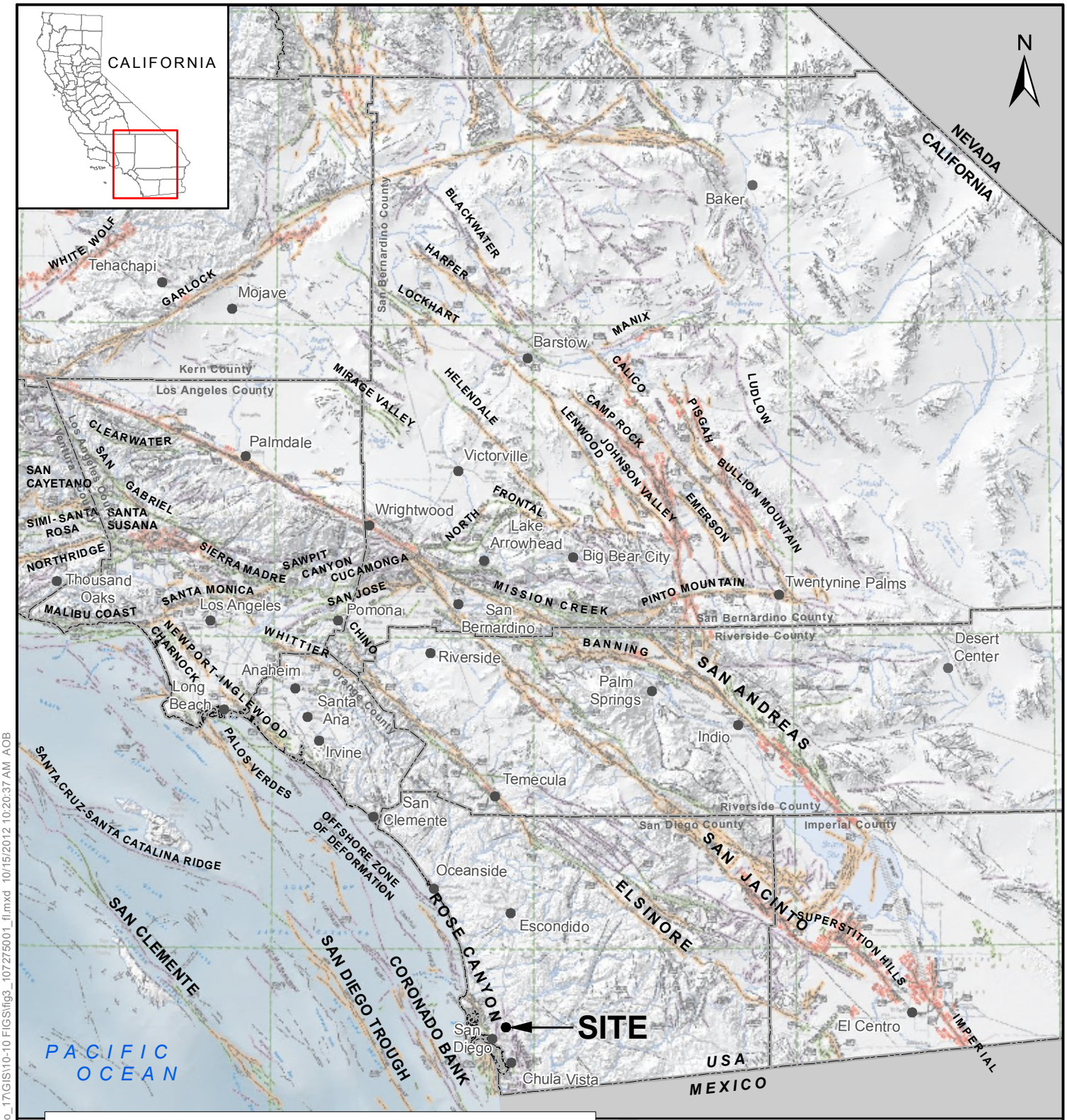

LEGEND

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
PROJECT NO. / DATE	TEMPORARY FIRE STATION NO. 17 UNIVERSITY AVENUE AND 41ST STREET SAN DIEGO, CALIFORNIA	3
107275001 / 11/12		

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

LEGEND

32	32 LOW LIQUEFACTION POTENTIAL - FLUCTUATING GROUNDWATER MINOR DRAINAGES
52	52 OTHER LEVEL AREAS, GENTLY SLOPING TO STEEP TERRAIN, FAVORABLE GEOLOGIC STRUCTURE, LOW RISK
53	53 LEVEL OR SLOPING TERRAIN, UNFAVORABLE GEOLOGIC STRUCTURE, LOW TO MODERATE RISK

SCALE IN FEET

0 850 1,700 3,400

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore

GEOLOGIC HAZARDS

FIGURE 4

PROJECT NO.	DATE
107275001	11/12

TEMPORARY FIRE STATION NO. 17
UNIVERSITY AVENUE AND 41ST STREET
SAN DIEGO, CALIFORNIA

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GEOTECHNICAL EVALUATION
FIRE STATION NO. 17 REPLACEMENT
4206 CHAMOUNE AVENUE
SAN DIEGO, CALIFORNIA

PREPARED FOR:
CCBG Architects
3677 Voltaire Street
San Diego, California 92106

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

March 23, 2012
Project No. 107275001

March 23, 2012
Project No. 107275001

Mr. Darrold Davis
CCBG Architects
3677 Voltaire Street
San Diego, California 92106

Subject: Geotechnical Evaluation
Fire Station No. 17 Replacement
4206 Chamoune Avenue
San Diego, California

Dear Mr. Davis:

In accordance with your request and authorization, we are providing this geotechnical evaluation for proposed new facilities to replace the existing Fire Station No. 17 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 March 16, 2010. Geotechnical recommendations for the temporary fire station will be provided in a separate report to be prepared by Ninyo & Moore.

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, Jr., PE, GE
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. MANSIR, JR.
No. 2739
EXP. 06/30/12
GEOTECHNICAL
STATE OF CALIFORNIA

Jonathan Goodmacher, PG, CEG
Manager/Principal Geologist

PROFESSIONAL GEOLOGIST
JONATHAN C. GOODMACHER
Exp. 10/31/13
No. 2136
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

MAC/KHM/JG/gg

Distribution: (1) Addressee

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Appendices

1. INTRODUCTION

In accordance with your request, we are providing this geotechnical evaluation for the proposed replacement of the existing Fire Station No. 17 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 will be provided in a separate report to be prepared by Ninyo & Moore, once the location is selected.

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 Underground Service Alert (USA) to clear the boring locations for the potential presence of underground utilities.
- Coring existing concrete at two locations to provide access for our subsurface evaluation.
- 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 geotechnical laboratory testing on selected samples.
- Preparing this report presenting our findings, conclusions, and recommendations regarding the geotechnical design and construction of the new fire station.

3. SITE AND PROJECT DESCRIPTION

Fire Station No. 17 is located at 4206 Chamoune Avenue in the City Heights community of the City of San Diego, California (Figure 1). Currently, construction at the site consists of the fire station building, an above ground fuel storage tank, a concrete parking lot and hardscape, and landscaped areas. The site is relatively flat, with a gentle slope to the south. The site coordinates are approximately 32.7534°N latitude and -117.0967°W longitude. The ground elevation is approximately 360 feet above mean sea level (MSL).

Based on our review of available documents (Gary Engineering, Inc, 2003), a 1,000-gallon diesel underground storage tank (UST) was removed from the northeastern portion of the site (Figure 2) and replaced with the existing above ground storage tank. According to the available information, the UST backfill should have been compacted to 90% of the relative density. However, information regarding the placement and compaction of backfill was not available for our review.

The new fire station will be constructed at the site of the existing Fire Station No. 17, which is to be demolished. The new fire station will be a three-story building 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 masonry or wood-frame and stucco building, including steel framing and trusses in the apparatus bay. We anticipate that the new structure will be supported on shallow spread or continuous footings with a slab-on-grade floor. We anticipate the parking lot will be constructed with Asphalt Concrete (AC) or Portland Cement Concrete (PCC).

4. SUBSURFACE EXPLORATION AND LABORATORY TESTING

Our subsurface exploration was conducted on February 24, 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 auger refusal and to a depth of up to approximately 9 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. Figures 3 and 4 are regional geologic and fault location maps.

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 4½ 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 and very old paralic deposits (Kennedy and Tan, 2008). Generalized descriptions of the earth units encountered during our subsurface exploration are provided below. Additional 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 2.5 feet. As encountered, these materials generally consisted of reddish brown to dark brown, moist, soft to stiff, silty or sandy clay, clay, and loose to medium dense, silty sand. Other fill materials could be present in the area of previous UST that was excavated and backfilled. The depth of this backfill is unknown.

5.2.2. Very Old Paralic Deposits ($Qvop_8$)

Quaternary-age very old paralic deposits, formerly referred to as the Lindavista Formation, were encountered in our exploratory borings below the fill to the total depths explored. As encountered, the materials generally consisted of reddish brown, moist, weakly to strongly cemented, silty and clayey sandstone with gravel and cobbles.

5.3. Groundwater

Groundwater was not encountered in our exploratory borings. Groundwater is anticipated to be deeper than 90 feet in the project vicinity (Ninyo & Moore, 2010). 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 4½ miles west of the site. It is noted that north-trending fault zones are mapped within 1 mile of the project site (City of San Diego, 2008; Kennedy and Tan, 2008). These faults are associated with the La Nacion fault zone; which is not mapped as active by the State of California. The La Nacion fault zone does not exhibit geomorphic features commonly associated with recent faulting (Elliot and Hart, 1977). Additionally, radiocarbon dates of unfaulted alluvium overlying the fault range from approximately 7,000 years (Hart, 1974) to in excess of 10,500 years (Elliot and Hart, 1977). We consider the seismic parameters associated with the closest known active fault, the Rose Canyon fault appropriate for design purposes. 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	4.5 (7.4)	7.2/B
Coronado Bank	18 (28)	7.6/B
Newport-Inglewood (Offshore)	34 (54)	7.1/B
Elsinore (Julian Segment)	37 (60)	7.1/A
Earthquake Valley	42 (68)	6.5/B
Elsinore (Temecula Segment)	43 (70)	6.8/A
Elsinore (Coyote Mountain Segment)	45 (73)	6.8/A
San Jacinto (Coyote Creek Segment)	59 (94)	6.8/A
San Jacinto (Anza Segment)	60 (96)	7.2/A
San Jacinto (Borrego Segment)	61 (98)	6.6/A
Palos Verdes	61 (98)	7.3/B

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	21 (33)
May 28, 1892	6.3	60 (97)

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 0.50g using the United States Geological Survey (USGS) (USGS, 2011) ground motion calculator (web-based). The design PGA was 0.33g 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.

5.6. 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 52 (Figure 5). Hazard Category 52 is characterized by areas of gently sloping to steep terrain with favorable geologic structure that possess low risk.

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 2.5 feet in our borings. Fill material is not suitable for structural support or reuse onsite and should be removed and disposed off properly.

- On-site fill soils have high potential for expansion and are not considered suitable for reuse as compacted fill and backfill.

- Backfill materials at previous UST location may not be suitable for structural support in its current condition, as the documentation regarding the placement and compaction of this backfill is not available for our review. The depth of this backfill is unknown.

- Materials of the very old paralic deposits, underlying the fill materials, are considered suitable for structural support of the proposed improvements. However, due to the presence of cobbles and oversize materials, additional processing should be anticipated.

- Based on our subsurface exploration, excavation of the subsurface materials should be feasible with heavy-duty excavation equipment in good working condition. However, cobbles or cemented zones should be anticipated to be encountered and additional effort including heavy ripping may be needed during excavation.

- Groundwater was not encountered in our borings. Groundwater is not anticipated to be a design consideration. However, perched zones and seepage may be encountered in some areas.

- The active Rose Canyon fault zone is located approximately 4½ 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 test presented in this report, 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, 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. Excavation of the subsurface materials should be feasible with heavy-duty excavation equipment in good working condition. As noted, cobbles or cemented zones should be anticipated to be encountered, and additional effort including heavy ripping may be needed during excavation.

7.1.3. Treatment of Existing Fill

Based on the results of our subsurface and laboratory evaluation, and as noted in the following section, the existing fill materials are considered highly expansive and not suitable for structural support of the fire station building and improvements. Due to the high potential for expansion, we recommend that the existing fill be removed to very old paralic deposits under planned building pad, parking areas, and other improvements. For the purposes of this report, the building pad is defined as the structural footprint plus a horizontal distance of 5 feet or the depth of the excavation below pad grade, whichever is greater. The removed fill materials should be disposed off properly. The extent and depths of removals should be evaluated by Ninyo & Moore's representative in the field based on the materials exposed.

7.1.4. Materials for Fill

Laboratory testing indicates the on-site fill soils have high potential for expansion. Therefore, the on-site fill soils are not suitable for re-use as fill. The on-site very old paralic deposits may be 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) and ACI 318 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 0.10 percent [1,000 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 should be sampled and tested in accordance with standard practice. Do not import soils that exhibit a known risk to human health, the environment, or both.

7.1.5. 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.

7.1.6. Utility Trench Backfill

Based on our subsurface evaluation, the on-site fill materials primarily consist of clay and are not suitable for re-use as trench backfill. Excavations in very old paralic deposits are anticipated to require heavy ripping and generate oversize materials. The on-site very old paralic deposits are generally suitable for re-use as trench backfill provided they are free of rocks greater than approximately 3 inches in diameter. Trench backfill materials should also be free of organic material, clay lumps, cemented chunks, and debris. 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	*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. 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, 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 6 and 7. 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 8. 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	1.6
Mapped Short Period Spectral Acceleration, S_S	1.23 g
Mapped One-Second Period Spectral Acceleration, S_1	0.45 g
Short Period Spectral Acceleration Adjusted For Site Class, S_{MS}	1.24 g
One-Second Period Spectral Acceleration Adjusted For Site Class, S_{M1}	0.70 g
Design Short Period Spectral Acceleration, S_{DS}	0.83 g
Design One-Second Period Spectral Acceleration, S_{D1}	0.46 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. These footings should be supported on very old paralic deposits. If footings are planned in the area of UST that was removed and backfilled, they should be deepened to be supported on very old paralic deposits. 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 very old paralic deposits 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, 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 and 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 apparatus bay slab section should be based on the 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 370 ohm-cm, a soil pH of 6.9, a chloride content of 440 ppm and a sulfate content of 0.150 percent (i.e., 1,500 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 0.150 percent by weight (i.e., 1,500 ppm). According to the American Concrete Institute (ACI) 318, the potential for sulfate attack is moderate for water-soluble sulfate content ranging from 0.10 to 0.20 percent by weight (i.e., 1,000 to 2,000 ppm) in soils. Therefore, the site soils may be considered to have a moderate potential for sulfate attack. We recommend using Type 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

The onsite fill material was evaluated to have an R-value of less than 5. For this and other reasons mentioned in Treatment of Existing Fill (Section 7.1.3), Materials for Fill (Section 7.1.4), and Corrosion (Section 7.4), we recommend the on-site fill material will be removed. Our preliminary flexible pavement design is based on an assumed R-value of 20

for import fill materials. 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. The preliminary recommended pavement sections are presented in Table 4. However, we recommend that we re-evaluate the pavement design, based on the R-value of the subgrade material exposed at the time of construction.

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

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 indices 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 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.

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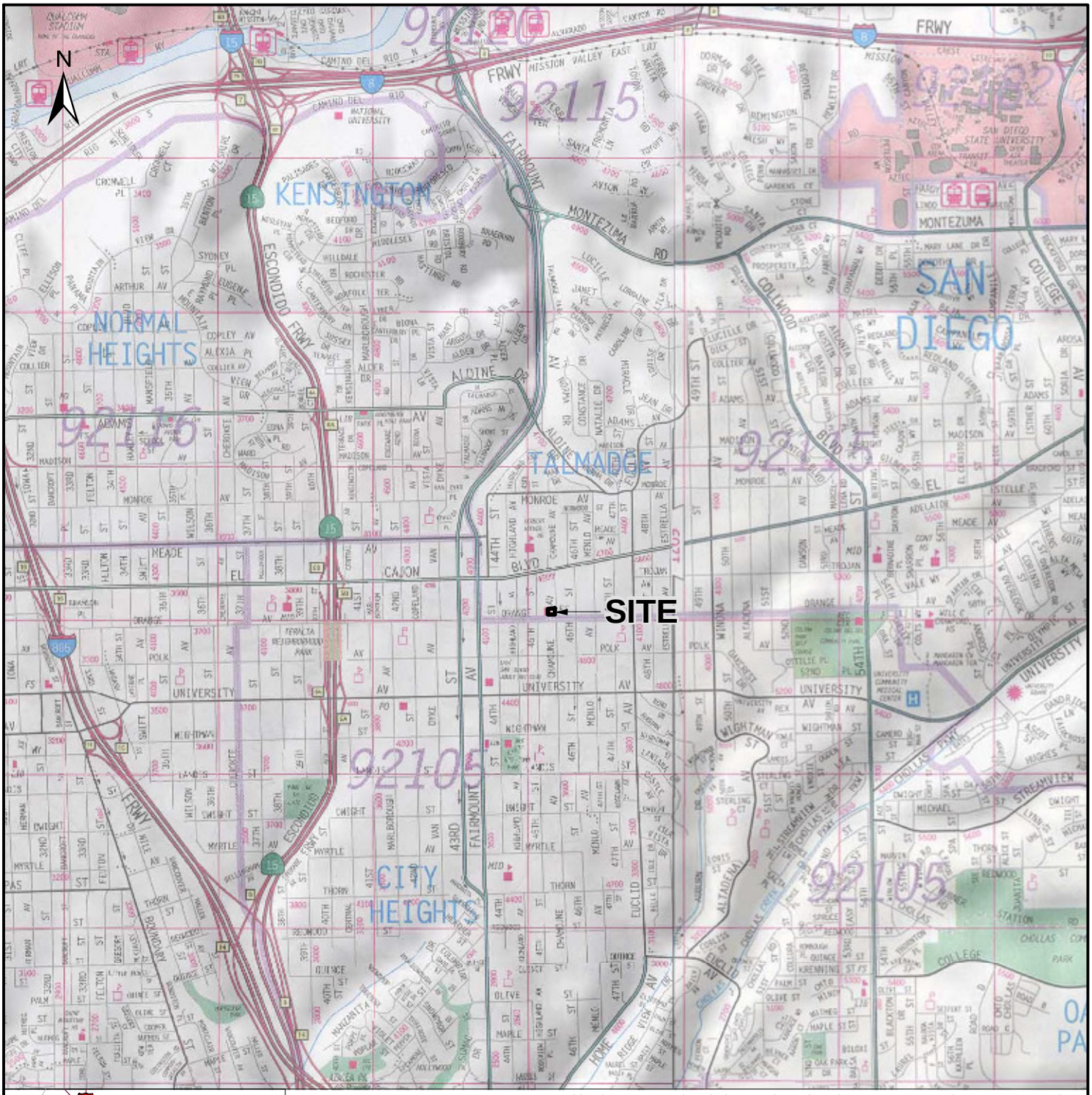
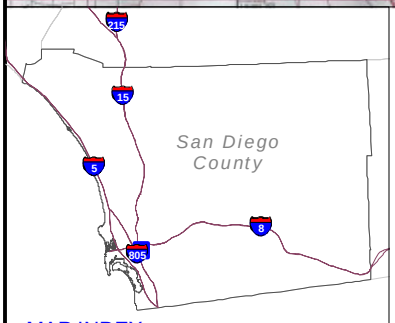
AERIAL PHOTOGRAPHS

Source	Date	Flight	Numbers	Scale
USDA	March 31, 1953	AXN-3M	96 and 97	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. 17 REPLACEMENT 4206 CHAMOUNE AVENUE SAN DIEGO, CALIFORNIA	1
107275001 / 3/12		

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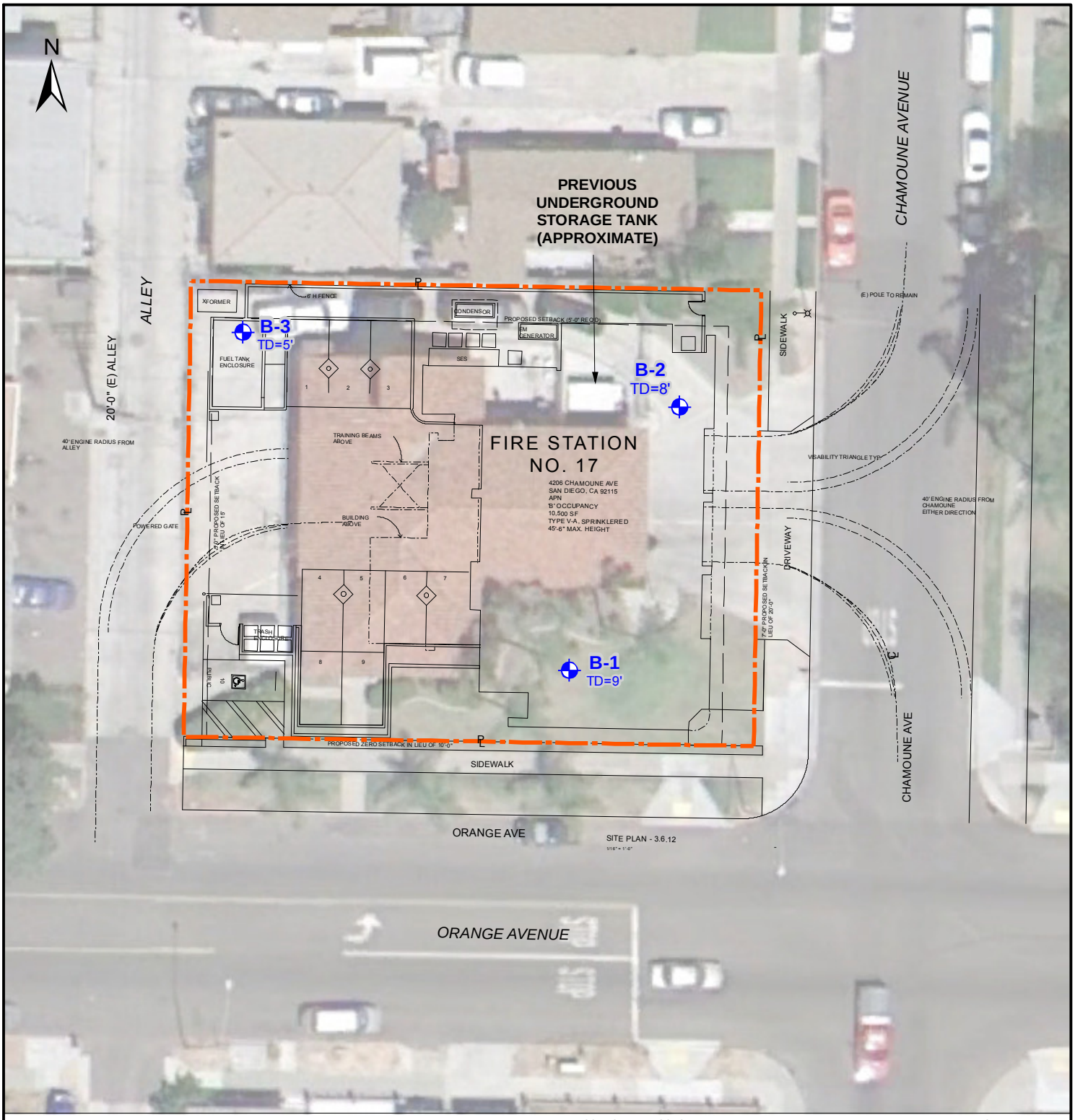

SOURCE: Plan - CCBG Architects, Inc., 2011; Aerial Imagery - Photo Date: August, 2012; (c) Google Earth, 2012

LEGEND

B-3 TD=5' BORING TD=TOTAL DEPTH IN FEET

SITE BOUNDARY

SCALE IN FEET

0 15 30 60

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	BORING LOCATIONS	FIGURE
PROJECT NO. / DATE	FIRE STATION NO. 17 REPLACEMENT 4206 CHAMOUNE AVENUE SAN DIEGO, CALIFORNIA	2
107275001 / 3/12		

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LEGEND

Qya	YOUNG ALLUVIAL FLOOD-PLAIN DEPOSITS
$Qvop_8$	VERY OLD PARALIC DEPOSITS, UNDIVIDED UNIT 8
Tsd	SAN DIEGO FORMATION, UNDIVIDED
Tp	POMERADO CONGLOMERATE
Tmv	MISSION VALLEY FORMATION
3	STRIKE AND DIP OF BEDS, INCLINED
U / D	FAULT - SOLID WHERE ACCURATELY LOCATED, DASHED WHERE APPROXIMATELY LOCATED. WHERE AGE WAS DETERMINED, AGE SYMBOL IS SHOWN ASTRIDE FAULT AND RELATIVE OFFSET, IF KNOWN, IS SHOWN BY "D" AND "U" ON DOWNTHROWN AND UPTHROWN SIDES.

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 **3**

PROJECT NO.	DATE
107275001	3/12

FIRE STATION NO. 17 REPLACEMENT
4206 CHAMOUNE AVENUE
SAN DIEGO, CALIFORNIA

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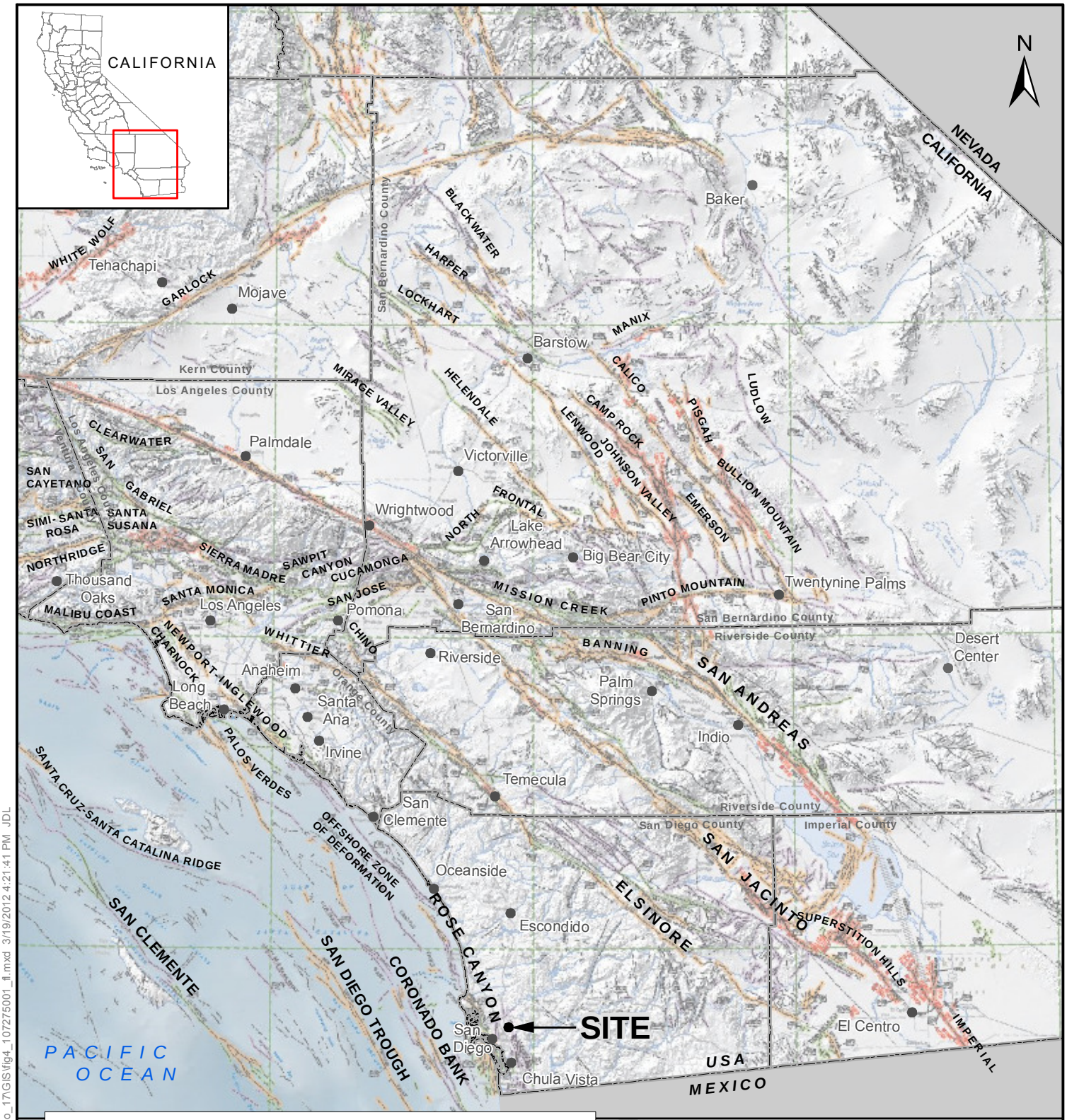

LEGEND

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
107275001	3/12

FIRE STATION NO. 17 REPLACEMENT
4206 CHAMOUNE AVENUE
SAN DIEGO, CALIFORNIA

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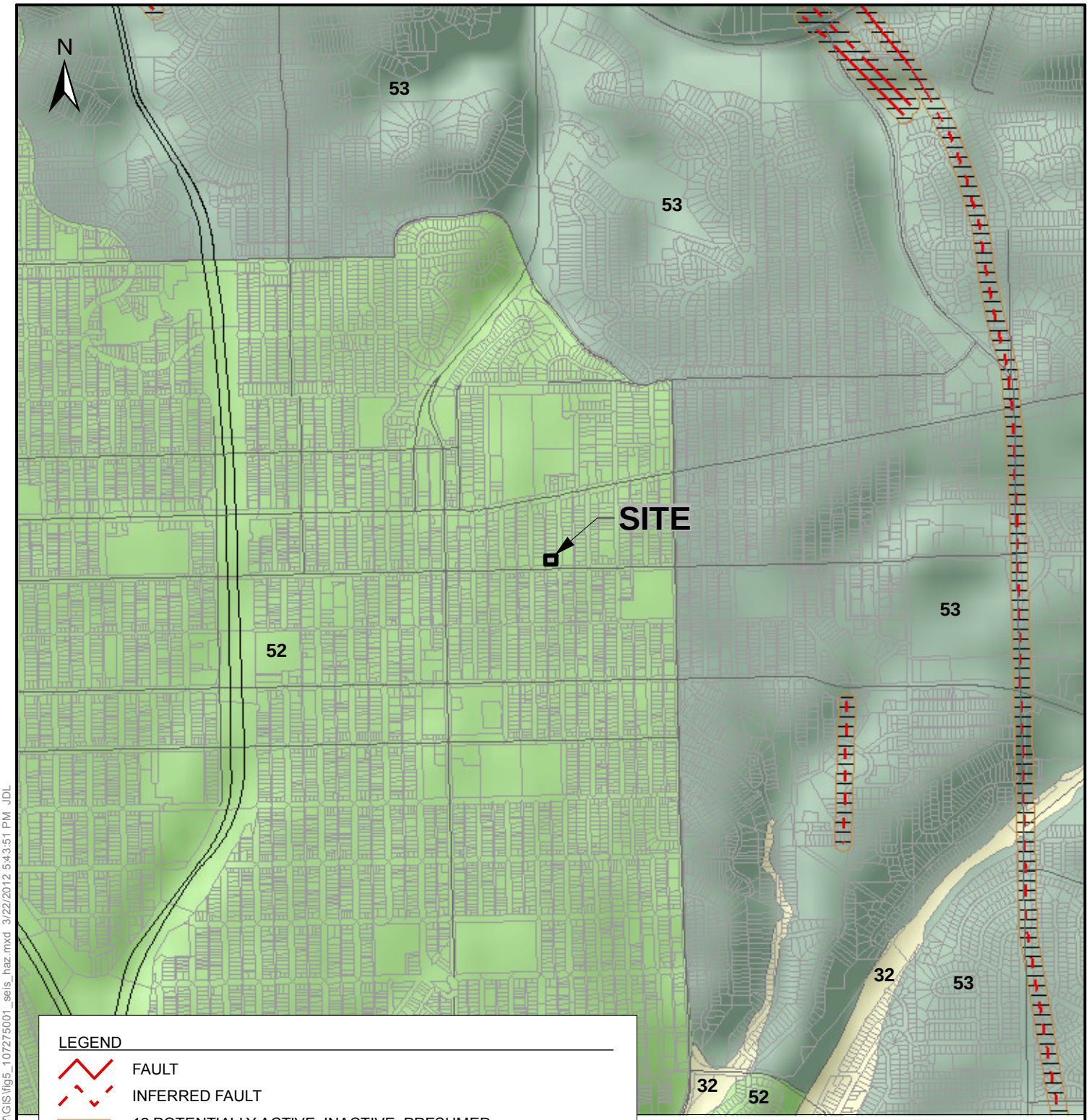

LEGEND

- FAULT
- INFERRED FAULT
- 12 POTENTIALLY ACTIVE, INACTIVE, PRESUMED INACTIVE, OR ACTIVITY UNKNOWN
- 32 — 32 LOW LIQUEFACTION POTENTIAL - FLUCTUATING GROUNDWATER MINOR DRAINAGES
- 52 — 52 OTHER LEVEL AREAS, GENTLY SLOPING TO STEEP TERRAIN, FAVORABLE GEOLOGIC STRUCTURE, LOW RISK
- 53 — 53 LEVEL OR SLOPING TERRAIN, UNFAVORABLE GEOLOGIC STRUCTURE, LOW TO MODERATE RISK

SOURCE: City of San Diego Seismic Safety Study Geologic Hazards and Faults, SanGIS, 2008

SCALE IN FEET

0 800 1,600 3,200

NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

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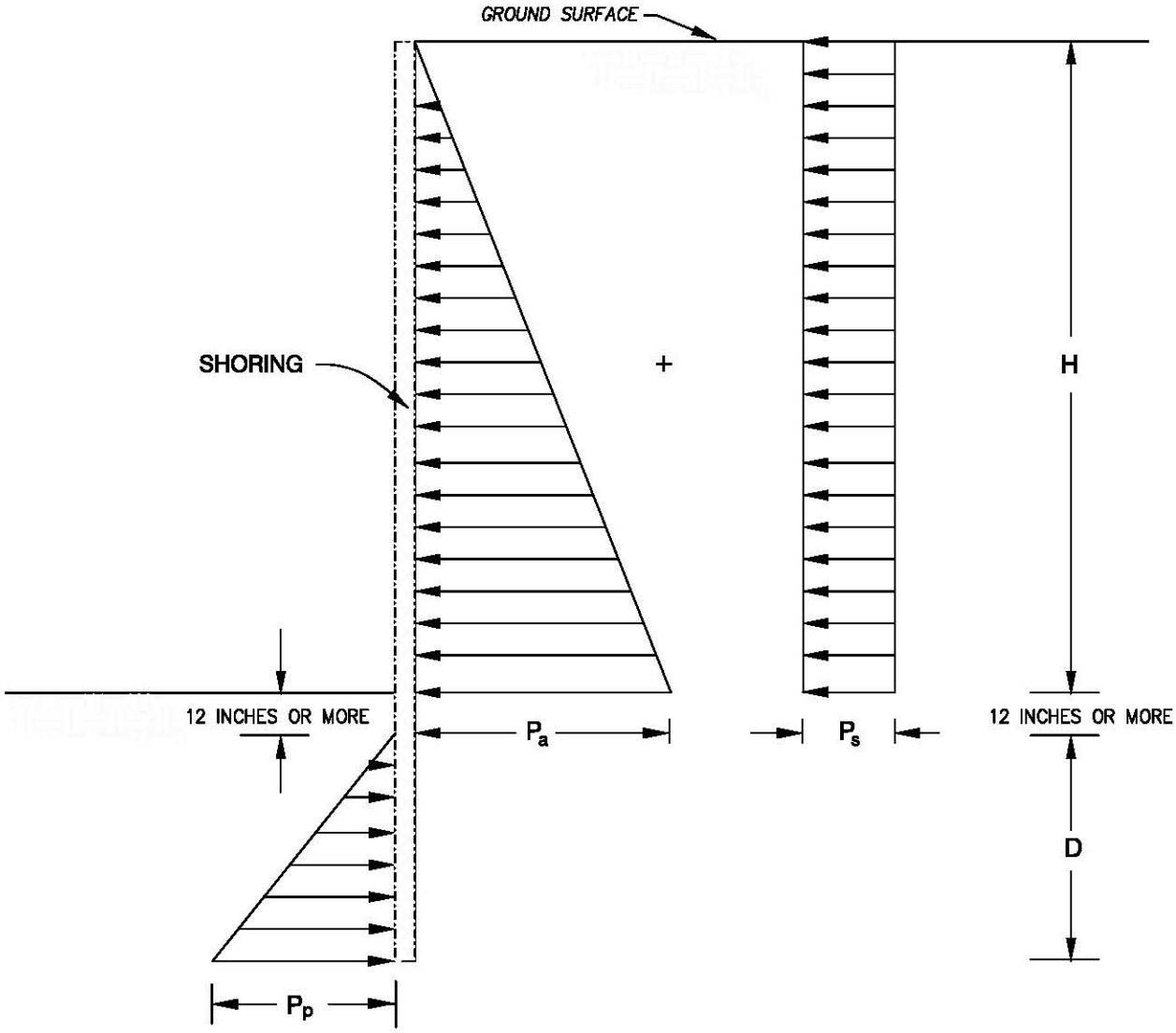
Ninyo & Moore	GEOLOGIC HAZARDS	FIGURE
PROJECT NO. / DATE	FIRE STATION NO. 17 REPLACEMENT 4206 CHAMOUNE AVENUE SAN DIEGO, CALIFORNIA	5
107275001 / 3/12		



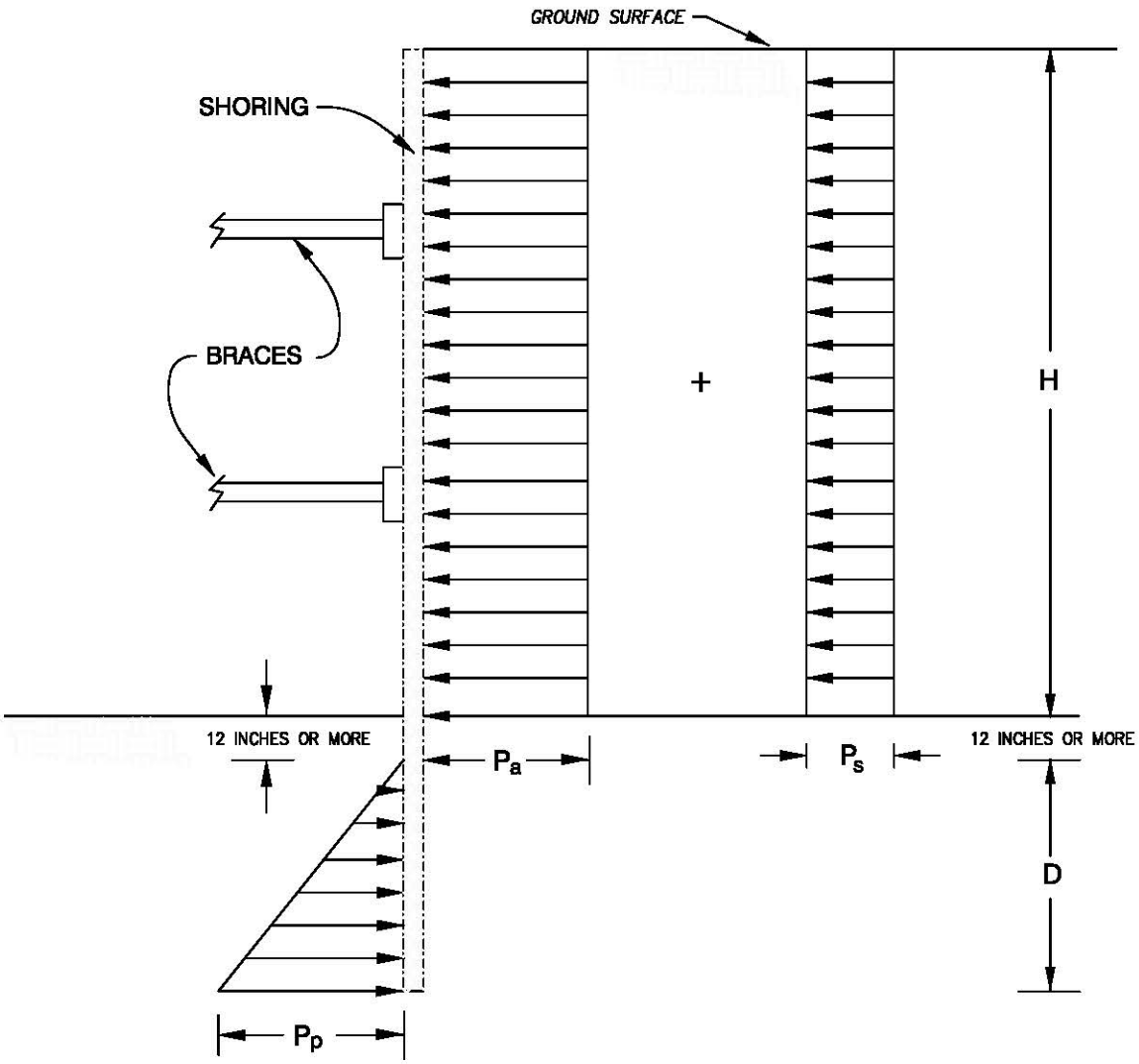
NOTES:

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

fig6 107275001 cant shor.dwg

Ninyo & Moore	LATERAL EARTH PRESSURES FOR TEMPORARY CANTILEVERED SHORING	FIGURE
PROJECT NO. 107275001 / DATE 3/12	FIRE STATION NO. 17 REPLACEMENT 4206 CHAMOUNE AVENUE SAN DIEGO, CALIFORNIA	6



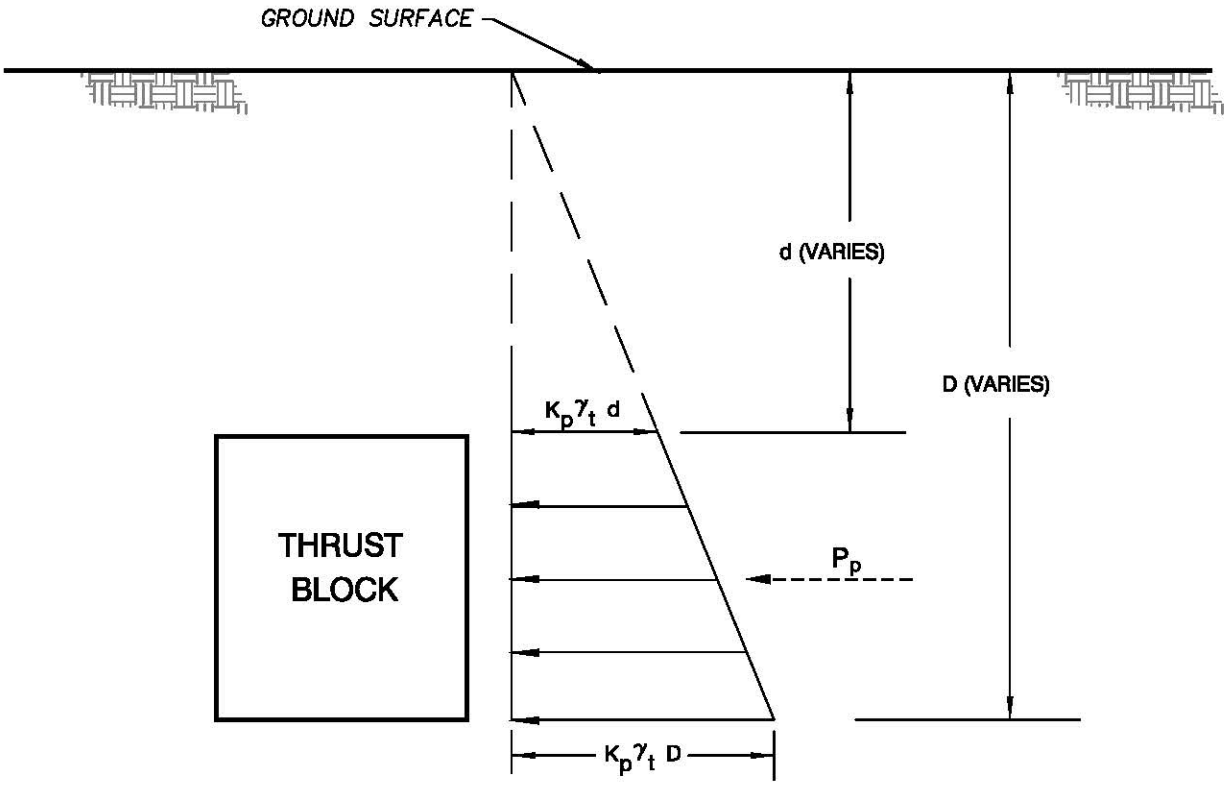
NOTES:

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

fig7 107275001 braced ex.dwg

Ninyo & Moore		LATERAL EARTH PRESSURES FOR BRACED EXCAVATION (GRANULAR SOIL)	FIGURE
PROJECT NO.	DATE	FIRE STATION NO. 17 REPLACEMENT 4206 CHAMOUNE AVENUE SAN DIEGO, CALIFORNIA	7
107275001	3/12		



NOTES:

1. GROUNDWATER BELOW BLOCK
   $P_p = 195 (D^2-d^2)$ 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

fig8 107275001 thrust.dwg

Ninyo & Moore	THRUST BLOCK LATERAL EARTH PRESSURE DIAGRAM	FIGURE
PROJECT NO. / DATE	FIRE STATION NO. 17 REPLACEMENT 4206 CHAMOUNE AVENUE SAN DIEGO, CALIFORNIA	8
107275001 / 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.

Ninyo & Moore

BORING LOG

Explanation of Boring Log Symbols

PROJECT NO.	DATE	FIGURE
	Rev. 11/11	

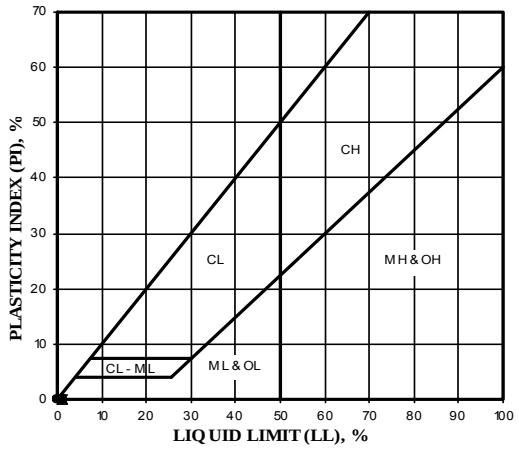
U.S.C.S. METHOD OF SOIL CLASSIFICATION

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



Ninyo & Moore

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

DATE DRILLED 2/24/12 BORING NO. B-1

GROUND ELEVATION 361' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 8" Hollow-Stem-Auger (Ingersoll Rand 300) (Scott's Drilling)

DRIVE WEIGHT 140 lbs. (Cathead) DROP 30"

SAMPLED BY NMM LOGGED BY NMM REVIEWED BY JG

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0					SM		FILL: Dark brown, moist, loose to medium dense, silty SAND.
			22.0		CL		Brown, moist, firm to stiff, silty CLAY; trace sand and roots.
							VERY OLD PARALIC DEPOSITS: Reddish brown, moist, weakly to moderately cemented, silty SANDSTONE; some clay, few gravel and cobbles (up to 4 inches in diameter).
5		50/5"	7.9	107.8			Moderately to strongly cemented. Auger refusal on cobbles.
							Total Depth = 9 feet. Groundwater not encountered. Backfilled shortly after drilling on 2/24/12.
10							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. 17 REPLACEMENT
4206 CHAMOUNE AVENUE, SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107275001	3/12	A-1

DATE DRILLED 2/24/12 BORING NO. B-2

GROUND ELEVATION 361' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 8" Hollow-Stem-Auger (Ingersoll Rand 300) (Scott's Drilling)

DRIVE WEIGHT 140 lbs. (Cathead) DROP 30"

SAMPLED BY NMM LOGGED BY NMM REVIEWED BY JG

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							CONCRETE: Approximately 5 inches thick.
						CL	FILL: Dark brown, moist, soft to firm, CLAY some silt; trace sand and roots.
5		50/5"					VERY OLD PARALIC DEPOSITS: Reddish brown, moist, weakly to moderately cemented, clayey SANDSTONE; few gravel. Moderately to strongly cemented. Auger refusal on cobbles.
10							Total Depth = 8 feet. Groundwater not encountered. Backfilled and patched with concrete shortly after drilling on 2/24/12. 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. 17 REPLACEMENT
4206 CHAMOUNE AVENUE, SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107275001	3/12	A-2

DATE DRILLED 2/24/12 BORING NO. B-3

GROUND ELEVATION 362' ± (MSL) SHEET 1 OF 1

METHOD OF DRILLING 8" Hollow-Stem-Auger (Ingersoll Rand 300) (Scott's Drilling)

DRIVE WEIGHT 140 lbs. (Cathead) DROP 30"

SAMPLED BY NMM LOGGED BY NMM REVIEWED BY JG

DEPTH (feet)	SAMPLES (Bulk / Driven)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							CONCRETE: Approximately 5 to 5-1/2 inches thick.
						CL	FILL: Reddish brown, moist, firm, sandy CLAY; fine sand.
		50/4"	9.6	108.6			VERY OLD PARALIC DEPOSITS: Reddish brown, moist, weakly to moderately cemented, clayey SANDSTONE; trace gravel and cobbles. Moderately to strongly cemented. Auger refusal on cobbles.
5							Total Depth = 5 feet Groundwater not encountered. Backfilled and patched with concrete shortly after drilling on 2/24/12. 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.
10							
15							
20							

Ninyo & Moore

BORING LOG

FIRE STATION NO. 17 REPLACEMENT
4206 CHAMOUNE AVENUE, SAN DIEGO, CALIFORNIA

PROJECT NO.	DATE	FIGURE
107275001	3/12	A-3

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.

Moisture Content

The moisture content of sample obtained from the exploratory boring was evaluated in accordance with ASTM D 2216. The test results are presented 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 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.

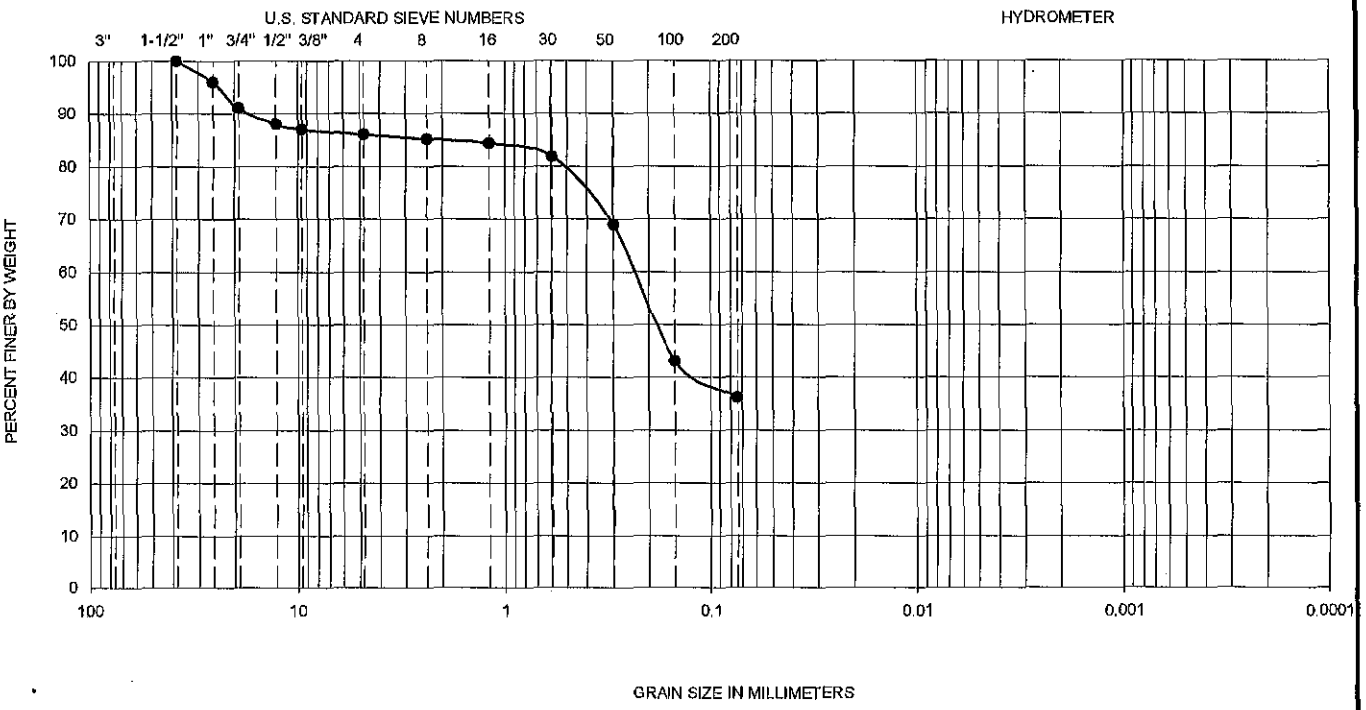
Soil Corrosivity Tests

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

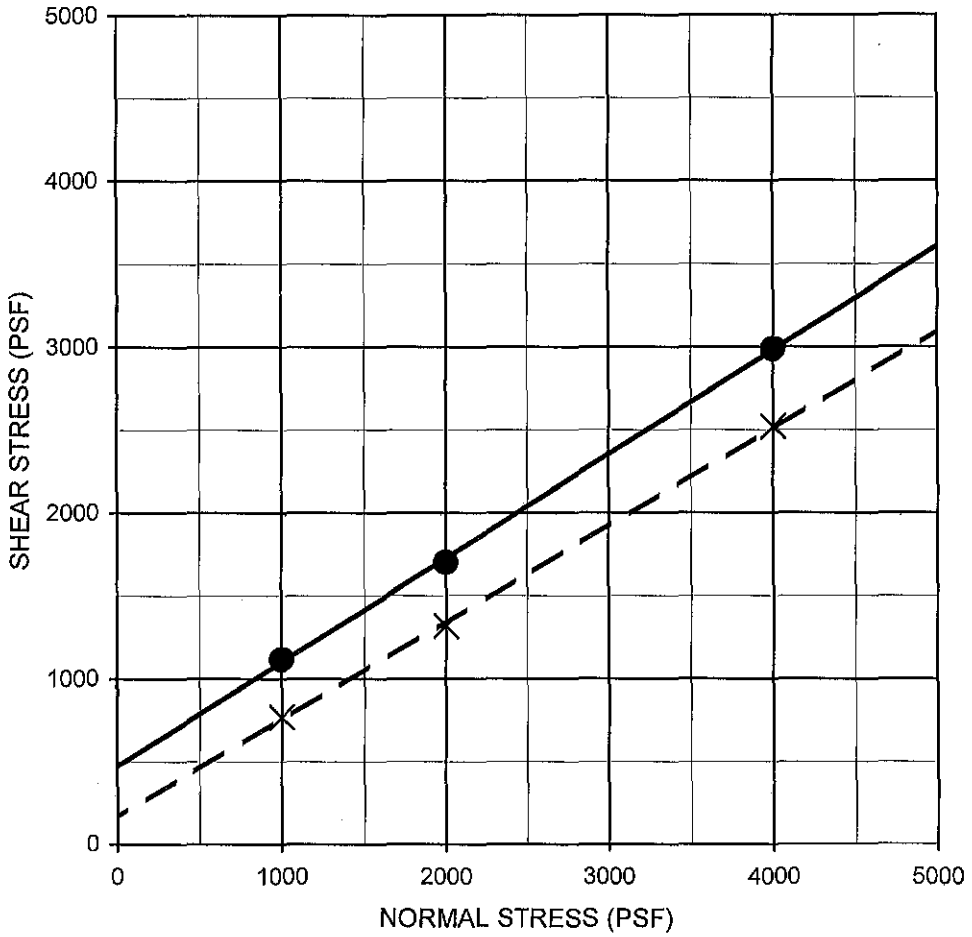


Symbol	Sample Number	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	Equivalent U.S.C.S
●	B-3	3.5-5.0	--	--	--	--	--	--	--	--	36	SC

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

Ninyo & Moore	GRADATION TEST RESULTS	FIGURE
PROJECT NO.	DATE	FIRE STATION NO. 17 REPLACEMENT 4206 CHAMOUNE AVENUE SAN DIEGO, CALIFORNIA	B-1
107275001	3/12		

107275001_SIEVE B-3 @ 3.5-5.0.xls



Description	Symbol	Sample Location	Depth (ft)	Shear Strength	Cohesion, c (psf)	Friction Angle, ϕ (degrees)	Soil Type
Silty SANDSTONE	—●—	B-1	5.0-6.0	Peak	470	32	Formation
Silty SANDSTONE	- - X - -	B-1	5.0-6.0	Ultimate	170	30	Formation

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 3080

Ninyo & Moore	DIRECT SHEAR TEST RESULTS	FIGURE
PROJECT NO. / DATE	FIRE STATION NO. 17 REPLACEMENT 4206 CHAMOUNE AVENUE SAN DIEGO, CALIFORNIA	B-2
107275001 / 3/12		

107275001_DIRECT SHEAR B-1 @ 5.0-6.0.xls

SAMPLE LOCATION	SAMPLE DEPTH (FT)	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (PCF)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (IN)	EXPANSION INDEX	POTENTIAL EXPANSION
B-2	0.5-3.0	14.0	96.4	29.9	0.102	103	High

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. 17 REPLACEMENT 4206 CHAMOUNE AVENUE SAN DIEGO, CALIFORNIA	B-3
107275001 / 3/12		

SAMPLE LOCATION	SAMPLE DEPTH (FT)	pH [1]	RESISTIVITY [1] (Ohm-cm)	SULFATE CONTENT [2]		CHLORIDE CONTENT [3] (ppm)
				(ppm)	(%)	
B-1	0.5-2.5	6.9	370	1,500	0.150	440

[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. 17 REPLACEMENT 4206 CHAMOUNE AVENUE SAN DIEGO, CALIFORNIA	B-4
107275001 / 3/12		

107275001_CORROSIVITY Page 1.xls

SAMPLE LOCATION	SAMPLE DEPTH (FT)	SOIL TYPE	R-VALUE
B-2	0.5-3.0	Clay (CL)	Less than 5

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2844/CT 301

Ninyo & Moore		R-VALUE TEST RESULTS	FIGURE
PROJECT NO.	DATE	FIRE STATION NO. 17 REPLACEMENT 4206 CHAMOUNE AVENUE SAN DIEGO, CALIFORNIA	B-5
107275001	3/12		

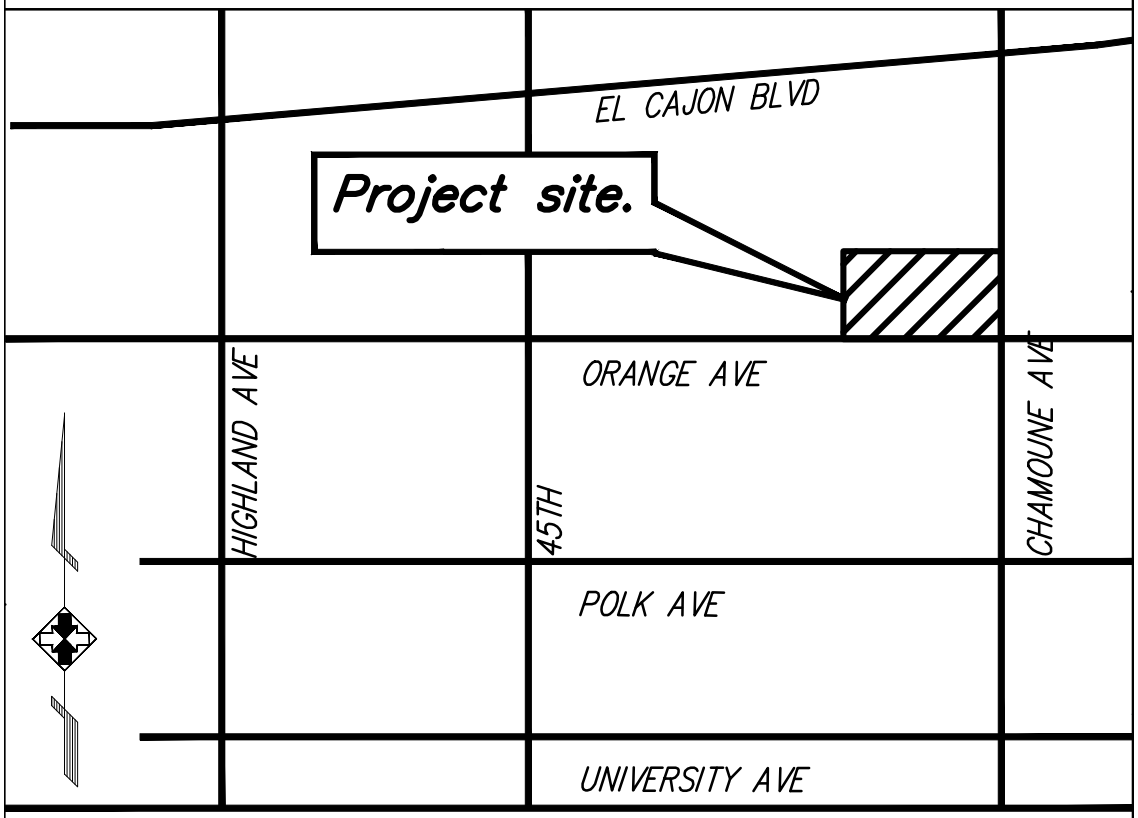
107275001_R-Value TABLE page 1.xls

APPENDIX D

PERMANENT AND TEMPORARY FIRE STATION, LOCATION MAPS

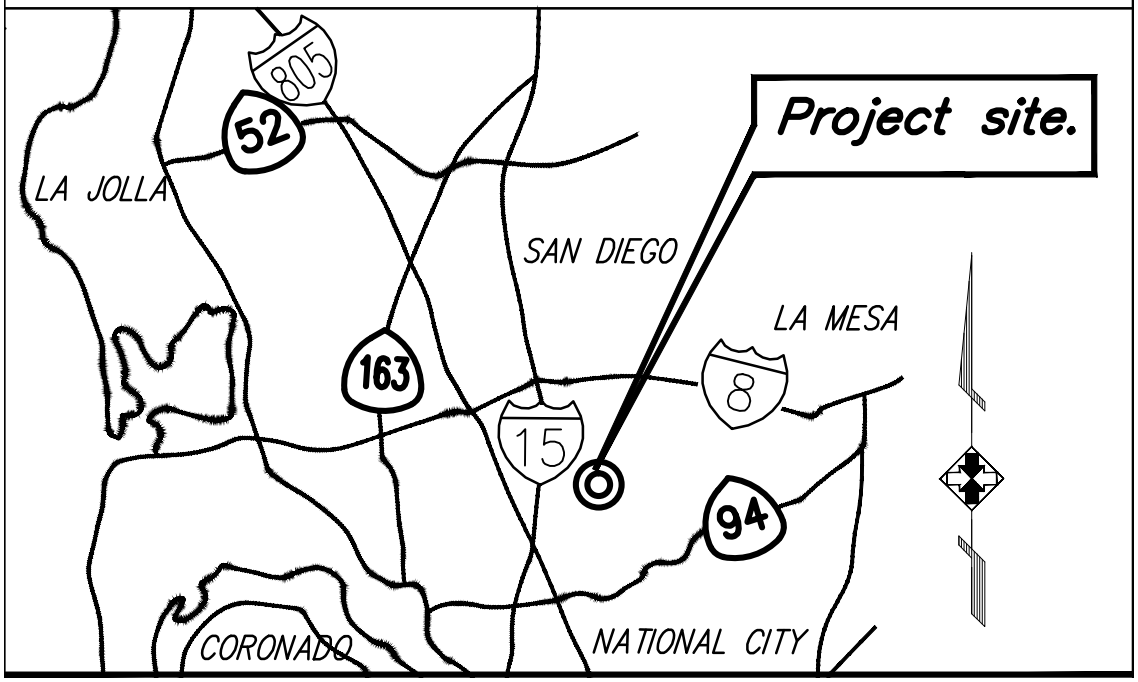
LOCATION MAP

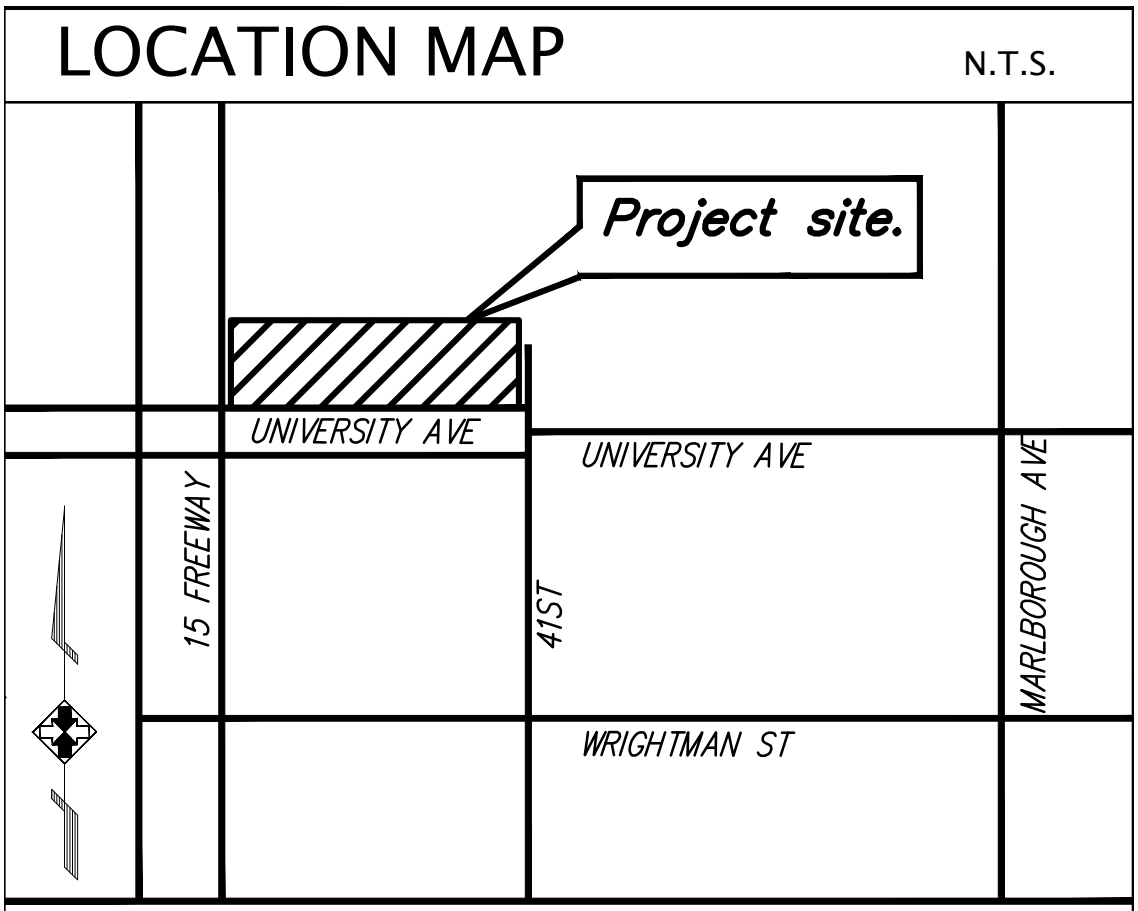
N.T.S.

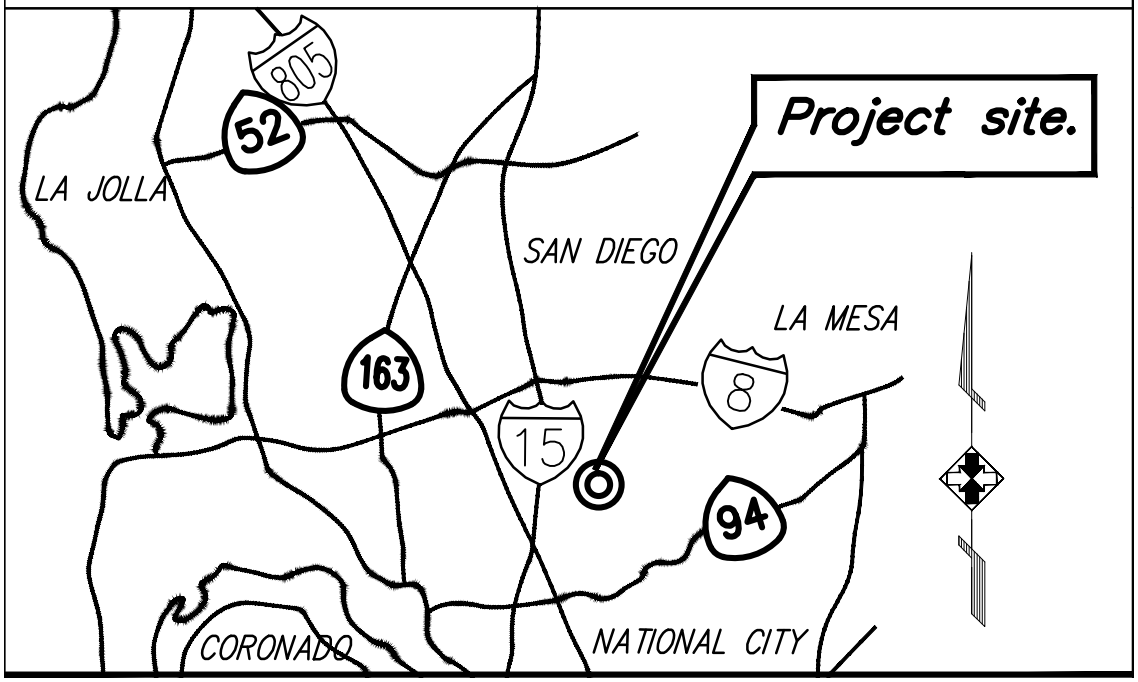


VICINITY MAP

N.T.S.

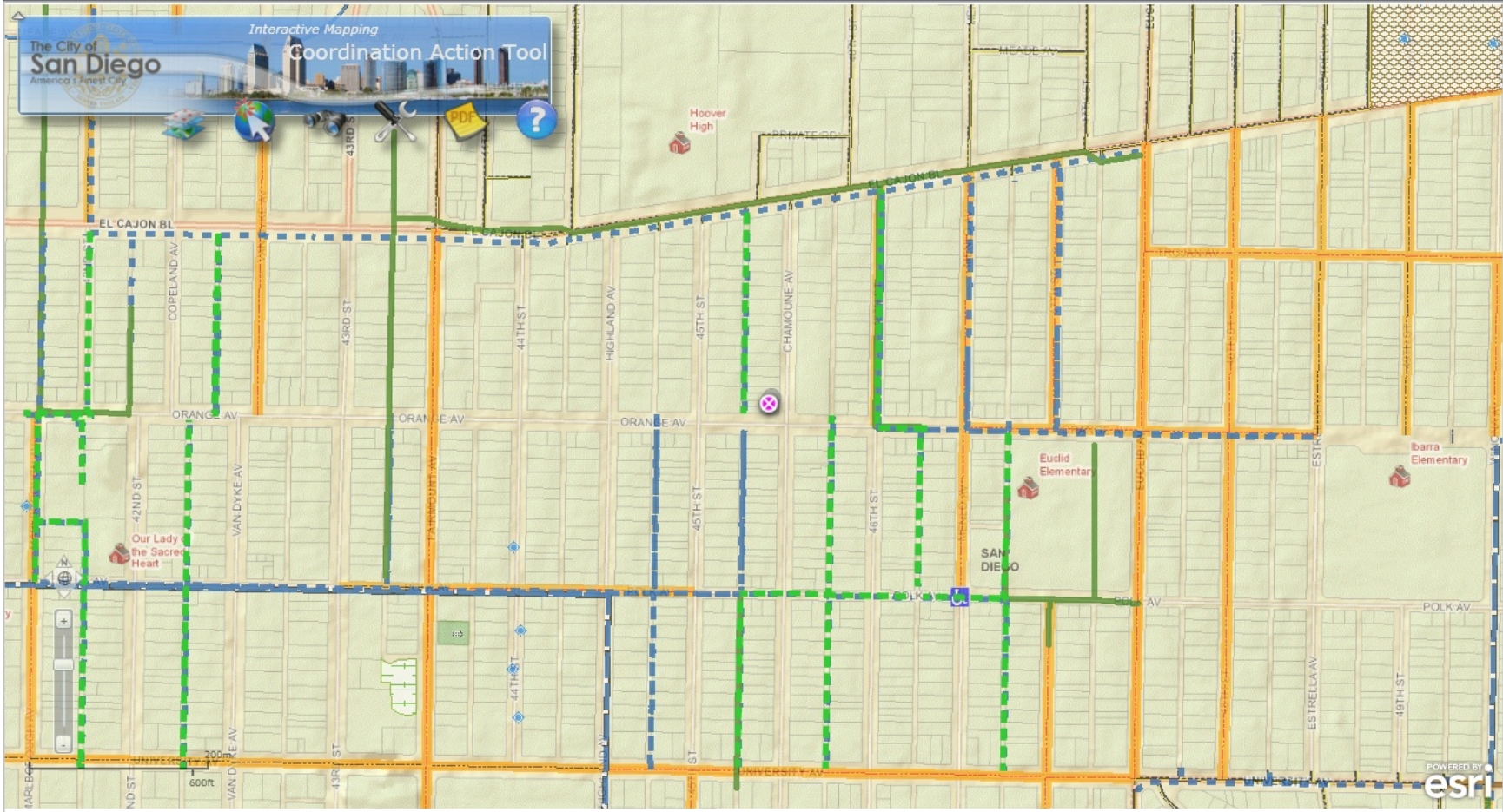



LOCATION MAP
N.T.S.
Project site.
UNIVERSITY AVE
UNIVERSITY AVE
15 FREEWAY
41ST
MARLBOROUGH AVE
WRIGHTMAN ST


VICINITY MAP
N.T.S.
805
52
Project site.
LA JOLLA
SAN DIEGO
LA MESA
163
8
15
94
CORONADO
NATIONAL CITY

APPENDIX E

ADJACENT PROJECTS



 Update Selected Update by SAP-ID

Selected-ID	Selected Contact	Conflicting-ID	Conflict Contact	Title	Resolved	Comments	Resolved By	Date
S00783	Jadan, Rowaida	B15078	Owen, Regan	AC Water & Sewer Group 1014 (W)	☐	Coordinated with the PM	RJadan	3/11/2015

APPENDIX F

WATER POLLUTION CONTROL PLANS (WPCP)

GENERAL CONSTRUCTION ACTIVITY

WATER POLLUTION CONTROL PLAN

FOR

FIRE STATION NO. 17

(CONSTRUCTION SITE PRIORITY LOW)

Project No. WBS S-00783

Drawing No. 36906-D

Prepared for:

City of San Diego
4206 Chamoune Ave
San Diego, CA 92105

Prepared by:

Alidade Engineering
28441 Rancho California Road, Suite 100
Temecula, CA 92590

July 10, 2013

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Illicit Connection/Illegal Discharge Detection and Reporting (NS-6)
Potable Water / Irrigation (NS-7)
Vehicle and Equipment Cleaning (NS-8)
Vehicle and Equipment Fueling (NS-9)
Vehicle and Equipment Maintenance (NS-10)
Concrete Curing (NS-12)
Concrete Finishing (NS-13)
Material Delivery and Storage (WM-1)
Material Use (WM-2)
Stockpile Management (WM-3)
Spill Prevention and Control (WM-4)
Solid Waste Management (WM-5)
Hazardous Waste Management (WM-6)
Contaminated Soil Management (WM-7)
Concrete Waste Management (WM-8)
Sanitary/Septic Waste Management (WM-9)
Liquid Waste Management (WM-10)

F. Construction Activity Schedule

G. Monitoring Record

H. Storm Water Requirements Applicability Checklist

MAP POCKETS:

1. WPCP Notes, Details and Site Map.

INTRODUCTION

This Water Pollution Control Plan (WPCP) has been prepared as part of the CIP Submittal requirements for the redevelopment of Fire Station No. 17 located at 4206 Chamoune Ave in the City of San Diego. This WPCP provides recommendations and procedures to fulfill storm water discharge requirements specified by the current City of San Diego Storm Water Standards Manual. Site information, description and responsible parties are provided within.

Water Pollution Control Plan (WPCP)

This WPCP has been prepared in accordance with the City of San Diego's Storm Water Standards Manual adopted on January 14, 2011. This WPCP has been developed and amended or revised, when necessary, to meet the following objectives:

- Identify all pollutant sources including sources of sediment that may affect the quality of storm water discharges associated with construction activity (storm water discharges) from the construction site, and
- Identify non-storm water discharges, and
- Identify, construct, and implement in accordance with a time schedule, and maintain Best Management Practices (BMPs) to reduce or eliminate pollutants in storm water discharges from the construction site during construction to the Maximum Extent Practicable (MEP), and
- Develop a maintenance schedule for BMPs installed during construction designed to reduce or eliminate pollutants after construction is completed (post-construction BMPs).

This WPCP shall be implemented concurrently with commencement of soil-disturbing activities associated with new construction or immediately for ongoing construction. The requirements of the WPCP are intended to be implemented on a year-round basis. All conditions of the WPCP shall be complied with.

The WPCP shall be kept at the construction site during construction activity and shall be made available upon request to representatives of the City of San Diego.

If a change of ownership occurs, the new owner shall be provided a copy of this WPCP and shall alert the City of San Diego of the change of ownership. The new owner shall amend this existing WPCP if necessary or develop a new WPCP within 30 calendar days.

This WPCP, together with all monitoring information, reports and data records for this construction activity, shall remain on the construction site while the site is under construction and during working hours, commencing with the initial construction activity and ending with termination of construction activity.

The discharger is required to retain records of all monitoring information, copies of all reports required by the WPCP, and records of all construction activities to be covered by the WPCP for a period of at least five years from the date generated. This period may be extended by request of the City of San Diego. With the exception of reporting noncompliance to the appropriate City personnel, dischargers are not required to submit the records, except upon specific request by the City of San Diego.

This WPCP shall be amended whenever there is a change in construction or operations, which may affect the discharge of pollutants to surface waters, ground waters or a municipal separate storm sewer system (MS4). The WPCP shall also be amended if the discharger violates any condition of this WPCP or has not achieved the general objective of reducing or eliminating pollutants in storm water discharges. If the City of San Diego determines that the discharger is in violation, the WPCP shall be amended and implemented in a timely manner, but in no case more than 14 calendar days after notification by the City of San Diego. All amendments shall be dated and directly attached to the WPCP.

The City of San Diego may require the discharger to amend the WPCP.

Construction Site Description:

This Water Pollution Control Plan (WPCP) has been prepared as part of the CIP Submittal requirements for the redevelopment of Fire Station No. 17 located at 4206 Chamoune Ave in the City of San Diego. The proposed improvements include demolition of the existing building, hardscape and landscaping and construction of a new building with associated hardscape and landscaping on site as well as construction of curb, gutter, sidewalk and driveway apron for the project site on Chamoune Ave.

Responsible Parties:
Owner:

City of San Diego
4206 Chamoune Ave
San Diego, CA 92105

Contractor: T.B.D.

Site Contact Person:

T.B.D.

SITE MANAGEMENT REQUIREMENTS

Due to the fact that construction is a dynamic operation where changes are expected, storm water BMPs for construction sites are usually temporary measures that require frequent maintenance and/or relocation, revision, and reinstallation to maintain their effectiveness, particularly as project grading progresses. The site contact person responsible for self inspections is yet to be determined.

There are four primary purposes of the self-inspections conducted by owners and contractors:

- To ensure that the owner/contractor takes full responsibility for managing storm water pollution caused by their activities.
- To ensure that storm water BMPs are properly documented and implemented and are functioning effectively.
- To identify maintenance (e.g. sediment removal) and repair needs.
- To ensure that the project proponents implement their Storm Water Management Plans.

A self inspection checklist noting date, time, conditions and inspection date must be kept on site and made available for review if requested by City Staff. The self-inspection must be performed by a qualified Contact Person according to the following schedule:

- Daily forecasting at all times.
- At 24-hour intervals during extended rainfall events.
- Daily evaluations as earth moving/grading are being conducted during the wet season.
- Weekly (every 7 days) in the dry season as earth moving/grading is processing.

Storm water pollution prevention site management requirements include:

- A qualified person who is trained and competent in the use of BMPs shall be on site daily, although not necessarily full time, to evaluate the conditions of the site with respect to storm water pollution prevention. This qualified contact person shall represent the contractor/owner on storm water issues.
- The qualified person shall implement the conditions of the Water Pollution Control Plan, contract documents and/or local ordinances with respect to erosion and sediment control and other waste management regulations.
- The qualified person is responsible for monitoring the weather and implementation of any emergency plans as needed. The weather shall be monitored on a 5-day forecast plan and a full BMP protection plan shall be activated when there is a 40% or greater chance of rain.
- The qualified person is responsible for overseeing any site grading and operations and evaluating the effectiveness of the BMPs. This person shall modify the BMPs as necessary to keep the dynamics of the site in compliance. This person or other qualified persons are responsible for checking the BMPs routinely for maintenance and documenting the BMPs being implemented.

PERFORMANCE STANDARDS

The City of San Diego will evaluate the adequacy of the owner's/contractor's site management for storm water pollution prevention, inclusive of BMP implementation, on construction sites based on performance standards for storm water BMPs. Poor BMP practices shall be challenged.

Performance standards shall include:

- No measurable increase of pollution (including sediment) in run-off from site.
- Prevention of slope erosion.
- Mitigation of runoff discharge velocity less than or equal to pre-construction levels.
- Preservation of natural hydraulic features and riparian buffers where possible.

A site will be considered inactive if construction activities have ceased for a period of 7 or more consecutive calendar days. At any time of the year, an inactive site must be fully protected from erosion and discharges of sediment. It is also the owner's/contractor's responsibility at both active and inactive sites to implement a plan to address all potential non-storm water discharges.

Regardless of inspections conducted by the City, property owners or contractors are required to prevent any construction-related materials, wastes, spills or residues from entering a storm water conveyance system.

SEASONAL REQUIREMENTS

A. Year round requirements include but are not limited to:

- Perimeter protection BMPs must be installed and maintained to comply with performance standards (above).
- Sediment control BMPs must be installed and maintained to comply with performance standards (above).
- BMPs to control sediment tracking must be installed and maintained at entrances/exits to comply with performance standards (above).
- Materials needed to install standby BMPs necessary to completely protect the exposed portions of the site from erosion and to prevent sediment discharges must be stored on site. Areas that have already been protected from erosion through implementation of physical stabilization or established vegetation stabilization BMPs (as described below) are not considered to be "exposed" for purpose of this requirement.
- The owner/contractor must have an approved "weather triggered" action plan and have the ability to deploy standby BMPs as needed to completely protect the exposed portions of the site within 24 hours of prediction of a storm event (a predicted storm event is defined as a forecasted 40% or greater chance of rain). On request, the owner/contractor must provide proof of this capability that is acceptable to the City of San Diego. The owner/contractor shall also show the area that will be cleared, graded and left exposed at any given time will be limited to the area that the owner/contractor can adequately protect prior to a predicted rainstorm.
- Deployment of physical or vegetation erosion control BMPs must commence as soon as grading and/or excavation is completed for any portion of the site. The project proponent may not continue to rely on the ability to deploy standby BMP materials to prevent erosion of graded areas that have been completed.
- Protect and stabilize all slopes during rain events.
- A washout area shall be designated and maintained for materials such as concrete, stucco, paint, caulking, sealants, drywall plaster, etc.
- Properly protected designated storage areas are required for materials and wastes.
- Trash and debris shall be removed and properly stored or disposed of daily.
- Storage, service, cleaning and maintenance areas for vehicles and equipment shall be identified and protected accordingly.
- Materials for spill control/containment must be stockpiled onsite.
- Non-storm water discharges must be eliminated or controlled to the maximum extent practicable.

B. Additional Requirements for the Rainy Season (October 1 through April 30) include but are not limited to:

- Erosion control BMPs must be upgraded, if necessary, to provide sufficient protection for storms likely to occur during the rainy season.
- Perimeter protection and sediment control BMPs must be upgraded, if necessary, to provide sufficient protection for storms likely to occur during the rainy season.
- Adequate physical or vegetation erosion control BMPs must be installed and established for all graded areas prior to the start of the rainy season. These BMPs must be

maintained throughout the rainy season. If a selected BMP fails, it must be repaired and improved, or replaced with an acceptable alternate as soon as it is safe to do so. The failure of a BMP shows that the BMP, as installed, was not adequate and the design should be corrected or modified as necessary. Repairs or replacements must therefore implement a more effective BMP.

- All vegetation erosion control must be established prior to the rainy season to be considered as a BMP.
- A disturbed area that is not completed but that is not being actively graded must be fully protected from erosion if left idle for 7 or more calendar days. The ability to deploy standby BMP materials is not sufficient for these areas. BMPs must actually be deployed.

BEST MANAGEMENT PRACTICES

Construction material loading, unloading, and access areas:

Construction materials shall be loaded and unloaded, as needed, at the construction site in areas that have minimal storm water run-on. Any spillage, which occurs during transfer, shall be cleaned up immediately. Each contractor and subcontractor shall bring to the job site only the material to be used that day. Large material items shall be placed adjacent to their installation points so as to minimize handling.

Equipment/vehicle storage, cleaning and maintenance areas:

Equipment storage, cleaning, and maintenance areas shall be designated for the duration of construction. No equipment, other than that used for the grading operations, shall be stored onsite. Each contractor and subcontractor shall be provided with a yard for material and equipment storage as designated. Silt fencing/fiber rolls shall be provided on the downstream side of the storage areas to prevent transport of contaminates due to spills or leakage. Diversion of run-on away from storage areas to minimize potential contamination shall be implemented.

All debris and waste from the contractor's cleaning and maintenance operations shall be properly disposed of via the following good housekeeping practices which shall be inspected regularly using the checklist included in this WPCP:

- cover and store materials, where practical,
- minimize contact with rainfall or runoff,
- minimize waste, and
- dispose of waste properly and recycle, where possible

Routine and emergency vehicle maintenance is expected to occur on-site when necessary. Vehicle storage, cleaning, and maintenance operations shall be limited to a designated area.

Methods of on-site storage and disposal of construction materials:

As mentioned above, each contractor and subcontractor shall be provided with a yard for material and equipment storage. If over 55 gallons is stored onsite, all paints and solvents are required to be stored inside a roofed and lockable storage container. The contractor or subcontractor shall store only enough product required and are responsible for following the manufacturer's directions for the proper use and disposal of used and unused products. All waste material generated shall be properly disposed of at an approved disposal site. Trash shall be separated by type of handling required, as described within this WPCP.

Construction materials to be disposed of shall be placed in dumpsters, other receptacles, or designated storage area appropriate for the waste material at the end of each working day.

The contractor and subcontractor shall take all necessary and proper precautions to protect adjacent property owners from any or all damage that may occur from storm water runoff and/or deposition of debris resulting from any and all work in conjunction with construction.

POTENTIAL POLLUTANT SOURCES

The primary potential source of pollution to storm water is sediment.

Potential pollutants other than sediment associated with construction activity include soil amendments, solvents, metals, petroleum products, plated products, asphalt/concrete, hazardous substances, treated wood products, and other products typically associated with construction sites. These materials can be classified into hazardous, solid, and liquid wastes. Hazardous wastes include solvents, metals, petrochemicals (oils, gasoline, asphalt degreaser, etc.) pesticides, (insecticides, fungicides, herbicides, rodenticides, etc.), and other construction chemicals such as concrete products, sealer, and wash water associated with these products. Other wastes include paper, wood, garbage, sanitary wastes, and fertilizer.

Pollutants such as oils, waxes, and water-insoluble pesticides, form surface films on water and solid particles. Also, oil films serve as a medium for concentrating water-soluble insecticides. Other than by use of very costly water-treatment facilities or long runoff water detention periods, these pollutants become nearly impossible to control once present in the runoff.

Non-stormwater discharges associated with the construction activities for this project may include street washing and dewatering. Although these flows may occur on-site, efforts shall be made to control these flows to the maximum extent practicable.

The contractor shall be responsible to implement a concrete wash out area, as shown on the Site Map attached at the end of this report, and pursuant to the plan notes located on said plan. It is anticipated that the location of the control practices shall change over the lifetime of the project; therefore, the contractor will note and date the changes on the appropriate maps within this WPCP, as applicable.

Pre-construction control practices (if any) to reduce sediment and other pollutants in storm water discharge:

Entry to and exit from the construction area shall be via either Chamoune Ave or the un-named alley adjacent to the westerly property line. If space allows, all access ways to pervious areas shall be via a stabilized construction entrance consisting of crushed aggregate greater than 3"and smaller than 6" (or equivalent) at a thickness of 12" minimum or as recommended by the soils engineer. The access way shall include a minimum of 24' of corrugated steel panels installed over the crushed aggregate. The stabilized construction entrance shall extend a minimum of 50 feet into the site and a temporary chain-link fence or alternate channelization device shall be installed to direct construction traffic through the stabilized construction entrance. Street surfaces adjacent to construction site exits shall be swept of visible dust and sand and the sediment removed from the street.

The City of San Diego is the local agency responsible for the administration of grading and erosion control plans through their land development permit process. The basic requirements and recommendations of the local land development ordinance are considered a part of the provisions of this WPCP.

Practices to control construction-related pollutants:

The following information summarizes the nature and control of various construction-related pollutants other than sediment.

(i) Solvents

Construction activity often uses solvents for de-greasing, cleaning machinery and machinery parts. For roofing activity, residual tars and sealing compounds, spent solvents, kerosene, and soap cleaners may be produced. For sheet metal activity, small quantities of acid and solvent cleaners such as kerosene, metal shavings, adhesive residues, and enamel coatings may be produced. Solvents which become waste material are classified as dangerous waste.

Recommended Control Best Management Practices (BMPs): Solvents and solvent associated wastes shall be stored in containers. The following practices apply to containers which are stored outside in a temporary storage area:

- Dumpsters used to store items avoiding transfer to a landfill shall be placed in a lean-to structure. Dumpsters shall be in good condition, without corrosion or leaking seams.
- If waste container drums are kept outside, they must be stored off the ground in a lean-to type structure or under plastic cover to prevent rainfall contact with the drums.
- Garbage dumpsters shall be replaced if they are deteriorating to the point where leakage is occurring and shall be covered to prevent storm water from entering.
- Use non-caustic detergents for parts cleaning.

- Use detergent-based or water-based cleaning systems in place of organic solvent degreasers.
- Replace chlorinated organic solvents (1, 1, 1 -trichloroethane, methylene chloride, etc.) with non-chlorinated solvents. Non-chlorinated solvents, such as kerosene or mineral spirits, are less toxic and less expensive to dispose of. Check the list of active ingredients to see whether it contains chlorinated solvents. (The "chlor" term indicated that the solvent is chlorinated.)
- Choose cleaning agents that can be recycled.

(ii) Metals

Various types of metals are used on a construction site.

Recommended Control BMPs: Where metals are temporarily stored outside, plastic sheeting shall be placed over the stockpile. This material shall be stored, where possible, on a paved surface. Curbing shall be placed along the perimeter of the area to prevent the run-on of uncontaminated storm water from adjacent areas, as well as runoff from the stockpile area.

(iii) Petroleum Products

Petroleum products are widely used during construction activities. These products are used as fuels and lubricants for vehicular operations, power tools, and general equipment maintenance. The pollutants include oils; fuels such as gasoline, diesel oil and kerosene; lubricating oils; and grease. Asphalt paving can be a pollutant source as it continues to release various oils for a considerable length of time. Most of these pollutants adhere to soil particles and other surfaces easily.

Recommended Control BMPs: One of the best practices of control is to dispose of sediments containing oil from the construction site into an authorized disposal facility.

Oil and oily wastes such as crankcase oil, cans, rags, and paper dropped in oils and lubricants shall be best disposed of in proper receptacles or recycled. Waste oil for recycling shall not be mixed with degreasers, solvents, antifreeze or brake fluid. The dumping of these wastes in sewers and other drainage channels is illegal and could result in fines or job shutdown. A further source of these pollutants is leaking vehicles. Proper maintenance of equipment and use of drip pans shall further reduce pollution by leaking vehicles.

Guidelines for storing petroleum products:

- Keep tanks off the ground and on wooden pallets.
- Store products off the ground under weather-resistant coverings, where possible.
- If storing more than 55 gallons, create shelter around area with cover and wind protection, and create impervious berm around the perimeter. Capacity of bermed area shall be 110 percent of largest container.
- All products shall be clearly labeled.

- Keep lids securely fastened.
- Post information for procedures in case of spills. Persons trained in handling spills shall be onsite or on-call at all times. Materials for cleaning up spills shall be kept onsite and easily available. Spills shall be cleaned up immediately and the contaminated material properly disposed of.

(iv) Plated Products

Plated products used on a construction site include galvanized material and other metal plated products.

Recommended Control BMPs: Where plated products are temporarily stored outside, plastic sheeting such as polyethylene, polyurethane, polypropylene or hypalon shall be used. Curbing shall be placed along the perimeter of the area to prevent the run-on of uncontaminated storm water from adjacent areas, as well as runoff from the stockpile area.

(v) Asphalt/Concrete

1 Asphalt

Asphalt paving requires dump trucks, pavers, tack coat tankers, and pavement rollers. Storm water passing through near this equipment may be contaminated by petroleum products.

Storm water from parking area may contain undesirable concentrations of oil and grease, suspended particulates, and metals such as lead, cadmium, and zinc. It shall also contain the organic by-products of engine combustion.

Recommended Control BMPS: Source control BMPs such as good housekeeping shall always be used to control storm water pollution.

2 Concrete

On construction sites, concrete may be pumped or transferred from trucks into the required area (i.e., new pedestrian access ramp / stairwell). Concrete wash-water from concrete trucks and mixers is a pollutant. Cement (in bags) may be stored onsite for small jobs.

Recommended Control BMPS: The control of this pollutant involves good site planning. Neutralization of this pollutant often provides the best treatment. Sealing of fractures in the bedrock with grout and bentonite shall reduce the amount of concrete wash seepage.

- Transfer of concrete/cement from vehicles to site shall be located so leaks can be confined in the existing containment.
- Place plastic sheeting over stored concrete material.

- Store material, where possible, on a paved area sloped in a manner that minimizes the pooling of water.
- Curbing shall be placed along the perimeter of the area to prevent run-on of uncontaminated storm water from adjacent areas as well as runoff from the stockpile area.

(vi) Hazardous Substances

The most economical and effective controls for potential pollutants other than sediment generated on the construction site, are the exercise of good housekeeping practices and an awareness of the need for compliance with regulatory requirements. The following general procedures are recommended based on the substance:

- Containers shall be located in a covered designated area.
- The designated area shall be paved, free of cracks and gaps, and impervious in order to contain leaks and spills.
- The area inside the curb shall slope to a drain. If the material being stored is controlled by the Uniform Fire Code, or is used oil or dangerous waste, a dead-end sump shall be installed.
- If roll-containers are used (i.e., dumpsters) and are picked up directly by the collection truck, a filet shall be placed on both sides of the curb to facilitate moving the dumpster.
- Construction activity accumulating dangerous wastes that do not contain free liquids shall be protected from storm water run-on.
- Where material is temporarily stored in drums, a containment system shall be used.
- Drums stored in an area where unauthorized persons may gain access must be secured in a manner that prevents accidental spillage, pilferage or any unauthorized use.
- An employee trained in emergency spill cleanup procedures shall be present when dangerous wastes, liquid chemicals or other wastes are loaded or unloaded.

(vii) Paints

Painting contractors shall generate paint and other finishing residues, spent thinners, and paint containers. Paint is a chemical pollutant containing hazardous metallic pigments or biocides, and is carried by sediment and runoff from construction sites.

Recommended Control BMPs: As in the case of other pollutants, good housekeeping is the most important means of controlling pollution. The correct method of waste disposal varies with the material. Wash-up wastes from water-based paints may go into a sanitary sewer, but wastes from oil-based paints, cleaning solvents, thinners, and mineral spirits must be disposed of through a licensed waste management firm. Other source-control BMPs include:

- Use tarps and vacuums to collect solid wastes produced by sanding or painting.

Tarps, drip pans, or other spill collection devices shall be used to collect spills of paints, solvents or other liquid materials. These wastes shall be disposed of properly to keep them from contaminating storm water.

- As little as 30 percent of the paint may reach the target from conventional airless spray guns; the rest is lost as overspray. Paint solids from overspray are deposited on the ground where they can contaminate storm water. Other spray equipment that delivers more paint to the target and less overspray shall be used: electrostatic spray equipment, air-atomized spray guns, high-volume/low-pressure spray guns, and gravity-feed guns.

(viii) Treated Wood Products

This group includes wood products such as cut wood and treated wood, and, where cutting equipment is employed, chips and sawdust. The timber is typically moved by hand after being deposited by truck. Other wastes include wood and paper from packaging and building materials.

Recommended Control BMPs: The major control mechanism for these pollutants is to remove collected wood waste and haul to an authorized disposal facilities. Outside areas where treated wood products are stored shall be located where storm runoff through the area is minimal.

- Where possible, store material on a paved area that is sloped so that pooling of water at the site is minimized.
- Remove and properly dispose of soils with visible surface contamination (green soil) to decrease the spread of chemicals to ground water and surface water and take steps to prevent future occurrences.
- Keep treated wood out of areas where surface water drainage is apparent. Curbing shall be placed along the perimeter of the area to prevent run-on of uncontaminated storm water from adjacent areas, as well as runoff from the stockpile area.

(ix) Training

The goal of the storm water pollution prevention training program is to inform employees, contractors, and subcontractors of their levels of responsibility for components and goals of the WPCP. This training program is a preventative maintenance technique, because when properly informed, employees, contractors, and subcontractors have increased awareness and are more capable of preventing spills, responding safely and effectively to accidents, and recognizing situations that could lead to storm water contamination.

Storm water pollution prevention training shall be provided regularly by the Contractor. One training session shall be presented just prior to the start of the wet season. Topics can include, but are not limited to: spill prevention and response, inspection records, annual reporting, locations and functions of sediment control devices, good housekeeping, and material

management practices. Attendance records shall be kept for each training session. Inspection logs and checklists shall be distributed to all personnel who shall be performing the monitoring and reporting. Appendix B presents the Training Log and is provided so that all training sessions can be documented. This log shall be revised/amended by the contractor/owner when appropriate

This WPCP has been prepared by:

ALIDADE ENGINEERING
28441 Rancho California Road, Suite 100
Temecula, CA 92590

7/10/13

Brent C. Moore, P.E. Date
Principal

APPENDIX A
Amendments of WPCP

DATE:	BY:	DESCRIPTION:

APPENDIX B
Training Log

Name of Person Attending Training Workshop	Date of Training Workshop	Title of Training Workshop	Location of Training Workshop

APPENDIX C
INSPECTION CHECKLIST FOR
WPCP PRE, POST AND DURING STORM EVENT INSPECTION REPORT
ORIGINAL – MAKE COPIES

Date of Inspection: _____ **Inspector's Name:**_____
Inspector's Title:_____
Time of Inspection:_____

Attach an 8 ½" x 11" Copy of Plans with Notes for each Location Listed below

Signed By:_____

Weather Information:

- Best estimate of beginning of storm:_____
- Duration of event:_____
- Amount of rainfall (inches):_____

Location and Description	Repair Required? Action
Location and Description	**Repair Required? Action**
Location and Description	**Repair Required? Action**
Location and Description	**Repair Required? Action**

APPENDIX C
Inspection Guidelines

PROTECTION DEVICES	INSPECT FOR:	MAINTENANCE MEASURES
Vegetation	• Rills or gullies forming	• Inspect for adequate stand of vegetation, re-seed
	• Bare soil patches	• Re-seed bare areas
	• Sediment at toe of slope	• Identify sediment source, control at source
Dikes	• Gully on slope below dike breach; low spot in dike	• Fill gully or low spot, re-compact
	• Loose soil	• Remove and re-compact
	• Erosion of dike face	• Install adequate protection
Swales	• Gully on slope below swale	• Fill gully; restore positive drainage
	• Water ponded in swale	• Properly grade to provide positive drainage and prevent ponding
	• Sediment or debris in channel	• Identify source of sediment or debris; install control measures at source. Remove sediment
	• Erosion of un-lined channel surface	• Install erosion protection
	• Erosion of channel lining	• Check construction. Install adequate protection.
Pipe slope drain or chute	• Blocked inlet or outlet	• Remove blockage
	• Runoff bypassing inlet	• Check construction. Check for clogging and check grade for positive drainage into inlet.
	• Erosion at outlet	• Check construction. Install adequate protection.

Grassed waterways	• Bare areas • Tall growth	• Re-vegetate bare areas • Restore channel conditions per plan
Riprap-listed waterway	• Scour under riprap	• Check construction. Install adequate protection.
Silt fence	• Undercutting of fence • Fence collapsing • Torn fabric • Runoff draining around barrier • Sediment level near top of fence	• Fill undercut and re-compact • Replace section • Replace torn fabric • Extend fence and/or re-grade to prevent • Remove sediment, dispose of properly
Check dam	• Sediment accumulation • Flow escaping around sides of check dam • Displacement of sandbag, stones or straw bales	• Remove sediment, dispose of properly • Check construction, repair/restore as necessary • Reconstruct per plan
Inlet protection	• Flooding around or below inlet • Undercutting of bales or silt fence, bale displacement, torn fabric, etc.	• Check grading/construction. Check for clogging and restore for positive drainage into inlet • Fill undercut and recompact
Outlet protection	• Dislodged stone • Erosion blew outlet • Outlet scour	• Restore erosion protection per plan • Check construction. Repair accordingly • Check construction. Repair accordingly
Sediment traps and basins	• Sediment level near outlet elevation	• Remove sediment, dispose of properly

	• Obstructed outlet • Basin not dewatered between storms	• Remove obstruction • Check construction, clean openings in outlet
	• Damaged embankments	• Repair damaged embankments
	• Spillway erosion	• Check construction. Repair accordingly
	• Outlet erosion	• Check construction. Repair accordingly
	• Riser flotation	• Check anchor block construction. Restore accordingly. Check riser couplings.
	• Excessive discharge to and from basin or trap • Sediment storage zone fills too quickly	• Check construction. Restore accordingly • Check construction. Restore accordingly

APPENDIX D

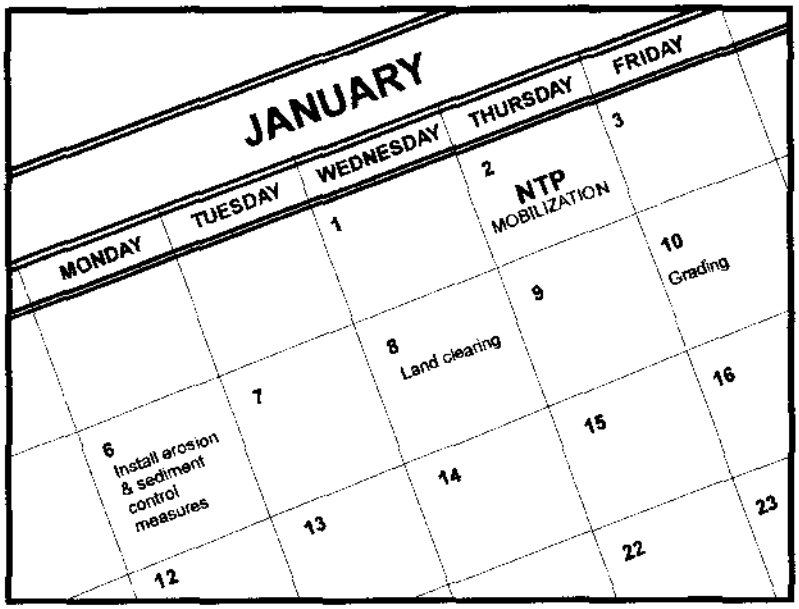
LIST OF CONTRACTORS/SUBCONTRACTORS

Name and Address Contractor/Subcontractor	Type of Work
	General Contractor

APPENDIX E
BMPs From Caltrans Storm Water Quality Handbook
"Construction Site Best Management Practices Manual"
Dated November, 2009.

Scheduling (EC-1)
Silt Fence (SE-1)
Fiber Rolls (SE-5)
Gravel Bag Berm (SE-6)
Street Sweeping and Vacuuming (SE-7)
Storm Drain Inlet Protection (SE-10)
Stabilized Construction Entrance/Exit (TC-1)
Wind Erosion Control (WE-1)
Water Conservation Practices (NS-1)
Paving and Grinding Operations (NS-3)
Illicit Connection/Illegal Discharge Detection and Reporting (NS-6)
Potable Water/Irrigation (NS-7)
Vehicle and Equipment Cleaning (NS-8)
Vehicle and Equipment Fueling (NS-9)
Vehicle and Equipment Maintenance (NS-10)
Concrete Curing (NS-12)
Concrete Finishing (NS-13)
Material Delivery and Storage (WM-1)
Material Use (WM-2)
Stockpile Management (WM-3)
Spill Prevention and Control (WM-4)
Solid Waste Management (WM-5)
Hazardous Waste Management (WM-6)
Contaminated Soil Management (WM-7)
Concrete Waste Management (WM-8)
Sanitary/Septic Waste Management (WM-9)
Liquid Waste Management (WM-10)

Scheduling EC-1



Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates

to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

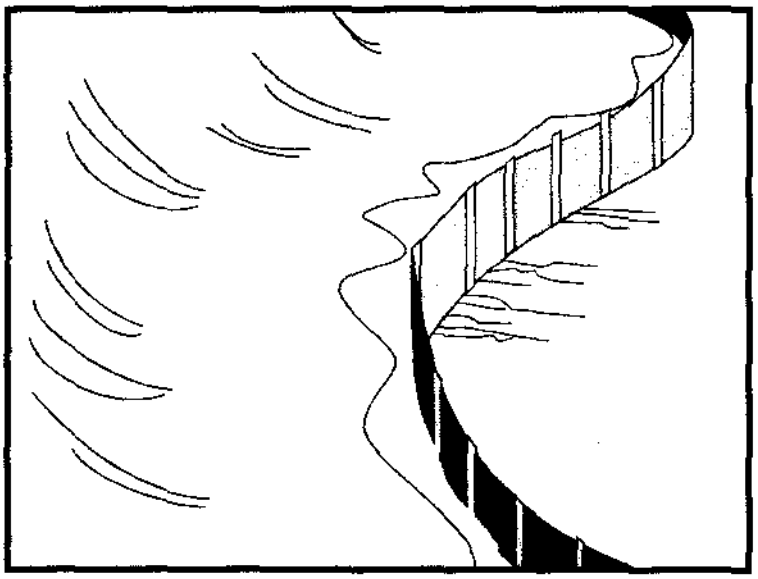
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Silt Fence SE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains water, promoting sedimentation of coarse sediment behind the fence. Silt fence does not retain soil fine particles like clays or silts.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences should not be used in locations where the flow is concentrated. Silt fences should always be used in combination with erosion controls. Suitable applications include:

- At perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

Targeted Constituents

Sediment (coarse sediment)	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm SE-12 Manufactured Linear Sediment Controls

SE-13 Compost Socks and Berms

SE-14 Biofilter Bags

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard.
- Do not use silt fence to divert water flows or place across any contour line.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Must be trenched and keyed in.
- Not intended for use as a substitute for Fiber Rolls (SE-5), when fiber rolls are being used as a slope interruption device.
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap coarse sediment by intercepting and detaining sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Silt fence should be used in combination with erosion controls up-slope in order to provide the most effective sediment control.
- Silt fence alone is not effective at reducing turbidity. (Barrett and Malina, 2004)
- Designers should consider diverting sediment laden water to a temporary sediment basin or trap. (EPA, 2012)
- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Efficiency of silt fences is primarily dependent on the detention time of the runoff behind the control. (Barrett and Malina, 2004)
- The drainage area above any fence should not exceed a quarter of an acre. (Rule of Thumb-100-feet of silt fence per 10,000 square feet of disturbed area.) (EPA 2012)

- The maximum length of slope draining to any point along the silt fence should be 100 ft per foot of silt fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area draining to the silt fence is permanently stabilized, after which, the silt fence fabric and posts should be removed and properly disposed.
- J-Hooks, which have ends turning up the slope to break up long runs of fence and provide multiple storage areas that work like mini-retention areas, may be used to increase the effectiveness of silt fence.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

In areas where high winds are anticipated the fence should be supported by a plastic or wire mesh. The geotextile fabric of the silt fence should contain ultraviolet inhibitors and stabilizers to provide longevity equivalent to the project life or replacement schedule.

- Layout in accordance with the attached figures.
- For slopes that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to protect silt fence from rocks (e.g., rockfall netting) ensure the integrity of the silt fence installation.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
- Use is generally limited to areas affected by high winds.
- Area draining to fence produces moderate sediment loads.

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. The fabric should conform to the requirements in ASTM designation D6461.
- Wooden stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the

thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts instead of wood stakes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).
- Bottom of the silt fence should be keyed-in a minimum of 12 in.
- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.
- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.
- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.
- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.
- The trench should be backfilled with native material and compacted.
- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of 1/3 and a maximum of ½ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the geotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
    - Ease of installation (most often done with a 2 person crew).
    - Minimal soil disturbance.
    - Better level of compaction along fence, less susceptible to undercutting
    - Uniform installation.
- Limitations:
    - Does not work in shallow or rocky soils.
    - Complete removal of geotextile material after use is difficult.
    - Be cautious when digging near potential underground utilities.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches 1/3 of the barrier height.
- Silt fences should be left in place until the upgradient area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.

- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Monitoring Data on Effectiveness of Sediment Control Techniques, Proceedings of World Water and Environmental Resources Congress, Barrett M. and Malina J. 2004.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), USEPA, 1990.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

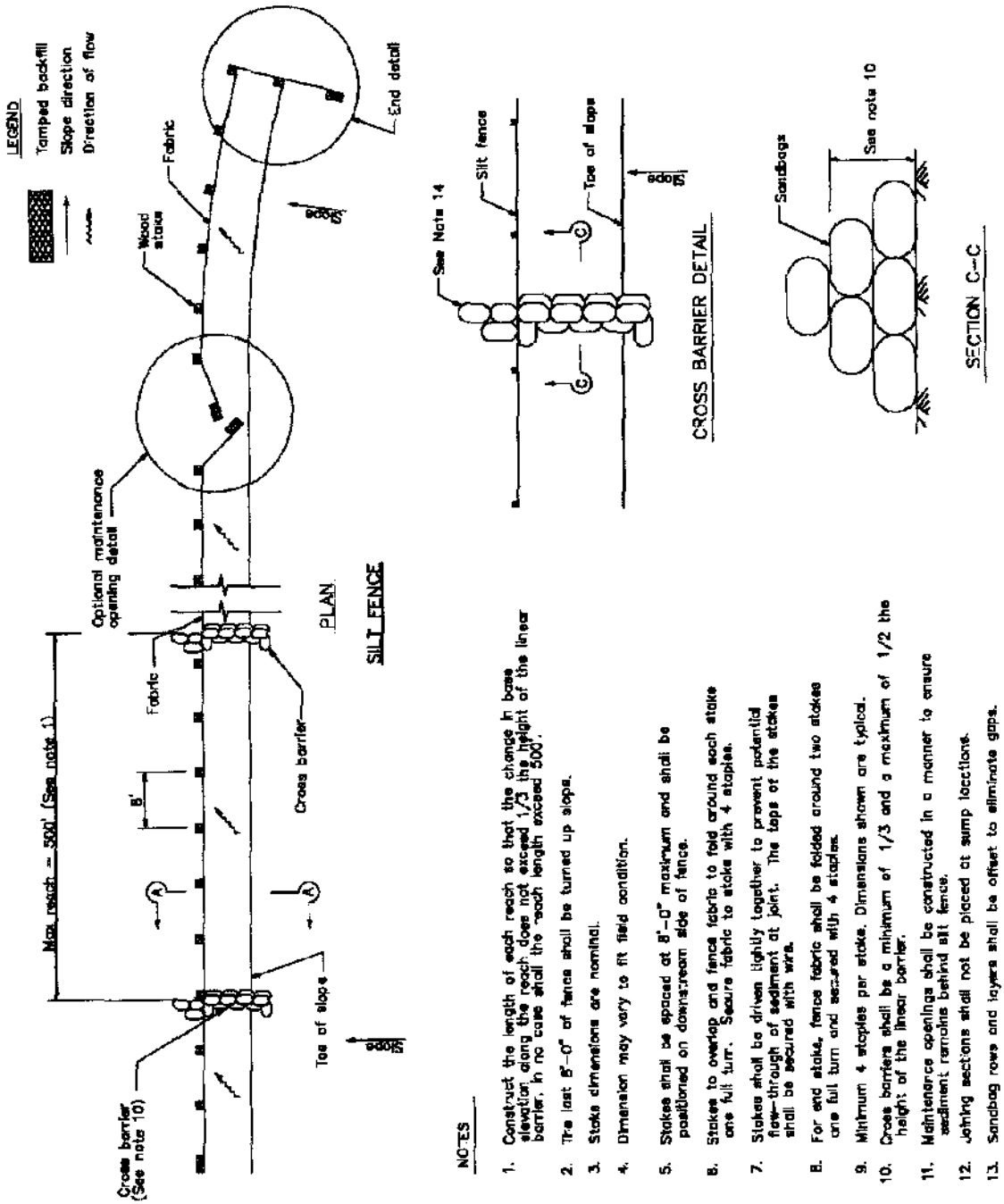
U.S. Environmental Protection Agency (USEPA). Stormwater Best Management Practices: Silt Fences. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 2012.

U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

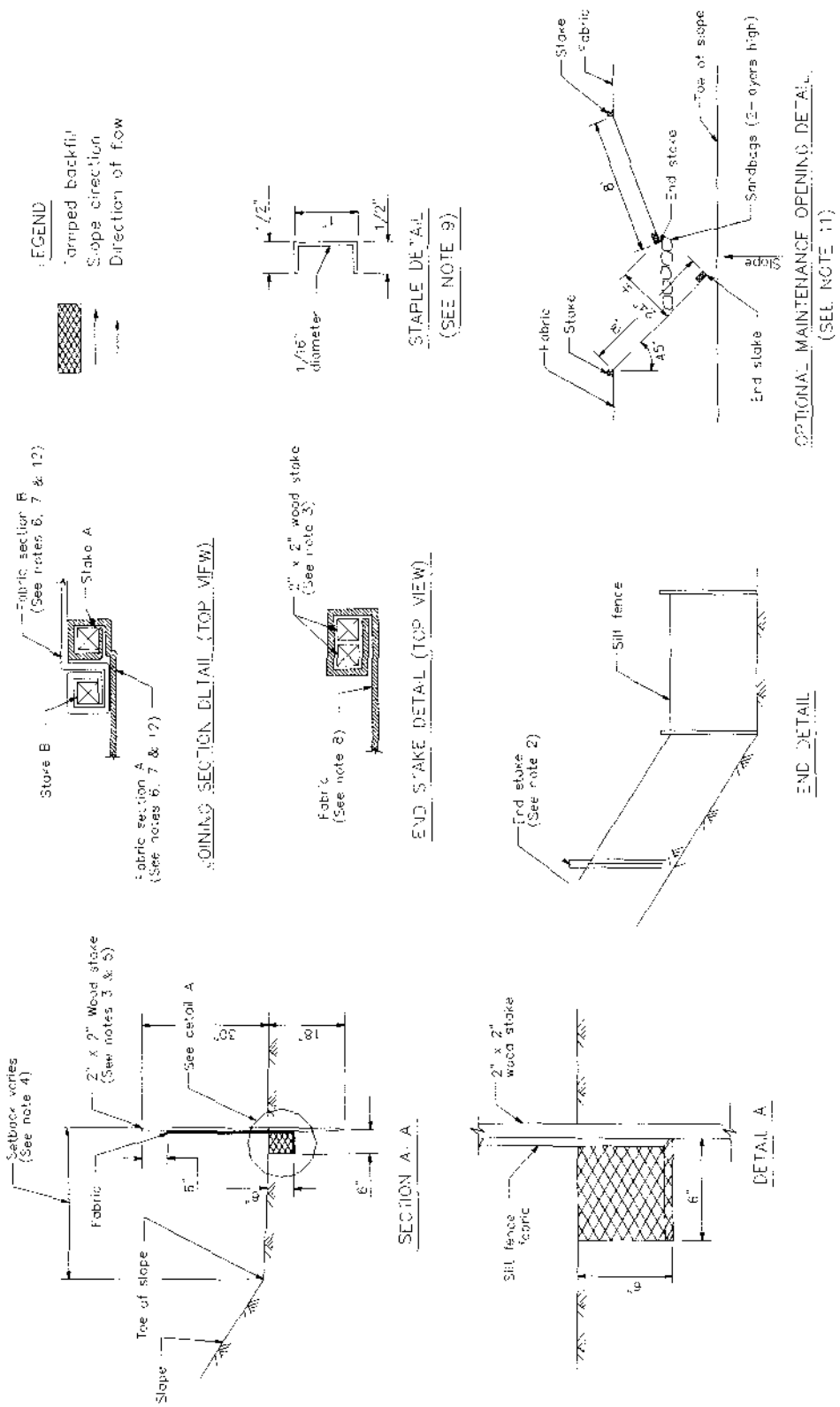
Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

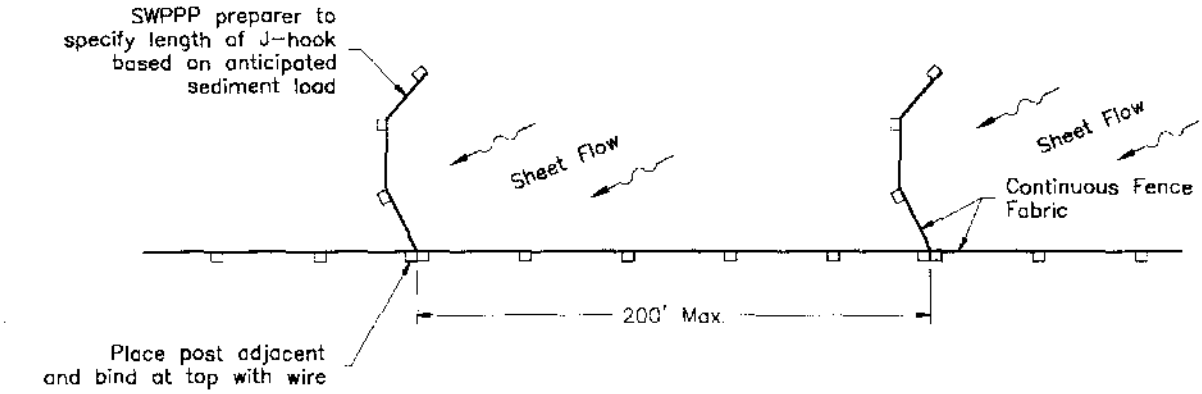
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'-0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'-0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3-4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.

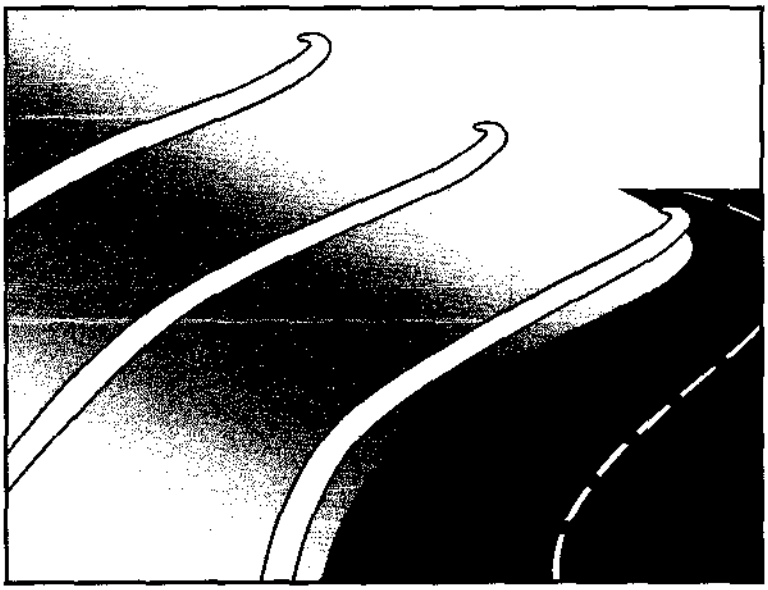

LEGEND
Barrier
Slope direction
Direction of flow
STAPLE DETAIL
(SEE NOTE 9)
1/2"
1/16" diameter
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Stake
Fabric
End stake
Toe of slope
Sandbags (2 layers high)
Slope
45°
CONCRETE
END DETAIL
Silt fence
End stake
(See note 2)
END STAKE DETAIL (TOP VIEW)
2" x 2" wood stake
(See note 3)
Fabric
(See note 8)
JOINING SECTION DETAIL (TOP VIEW)
Fabric section B
(See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A
(See notes 6, 7 & 12)
SECTION A-A
Setback varies
(See note 4)
2" x 2" Wood stake
(See notes 3 & 5)
See detail A
Fabric
Toe of slope
Slope
DETAIL A
2" x 2"
wood stake
Silt fence
fabric


SWPPP preparer to specify length of J-hook based on anticipated sediment load
Sheet Flow
Sheet Flow
Continuous Fence Fabric
200' Max.
Place post adjacent and bind at top with wire

Plan

J-HOOK

Fiber Rolls SE-5



Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-12 Manufactured Linear Sediment Controls

SE-14 Biofilter Bags

- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

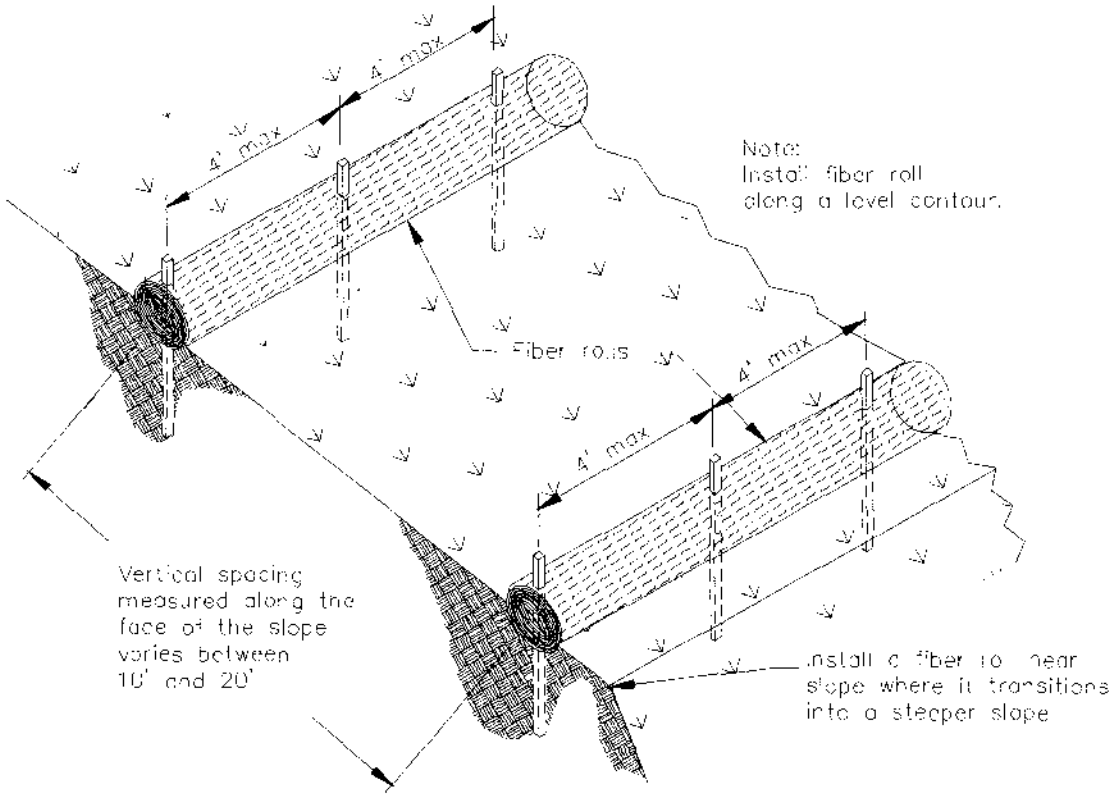
in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

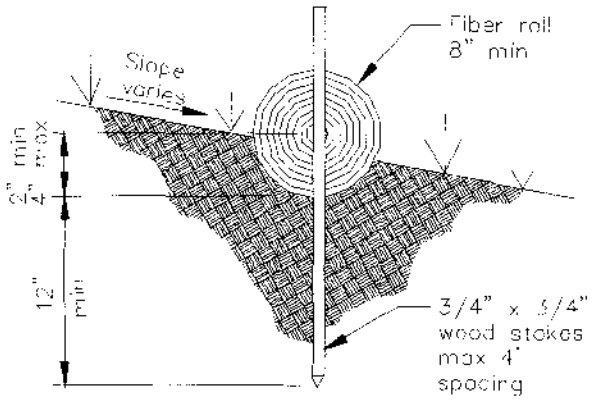
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

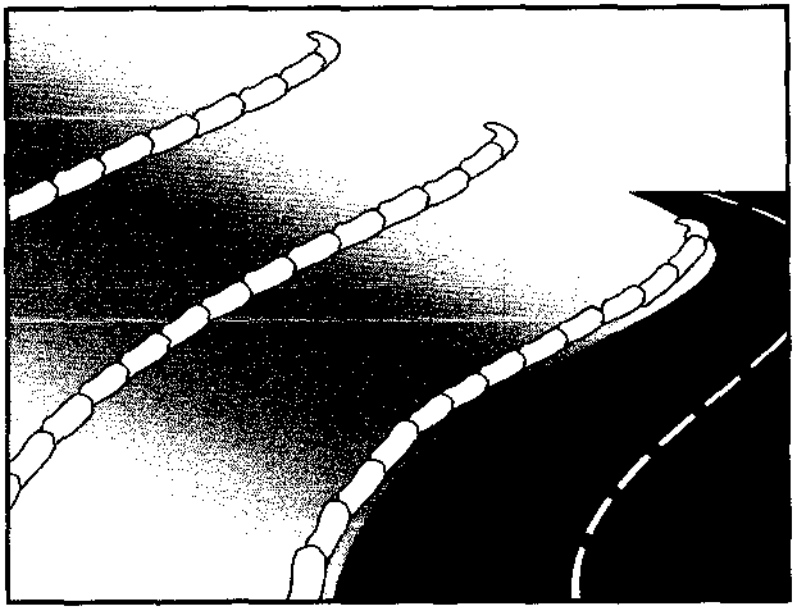


TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Gravel Bag Berm SE-6



Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** Fill material should be 0.5 to 1 in. crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs

Material costs for gravel bags are average and are dependent upon material availability. $2.50-3.00 per filled gravel bag is standard based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace gravel bags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

References

Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Street Sweeping and Vacuuming SE-7

Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

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CALIFORNIA STORMWATER

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

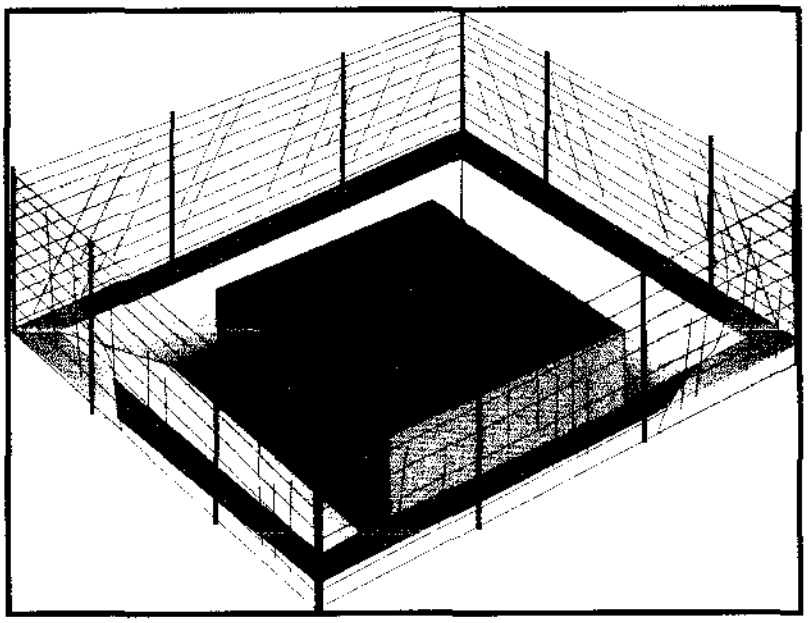
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Storm Drain Inlet Protection SE-10



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

SE-13 Compost Socks and Berms

Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area in, around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction. Temporary geotextile storm drain inserts attach underneath storm drain grates to capture and filter storm water.

Suitable Applications

- Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use

other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.
- Seven types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.

- Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
- Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
- Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
- Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
- Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
- Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
- Compost Socks: Allow filtered run-off to pass through the compost while retaining sediment and potentially other pollutants (SE-13). Appropriate for flows under 1.0 cfs.

- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Silt Fence*** - Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.

  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

5. Backfill the trench with gravel or compacted earth all the way around.

- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap*** - Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

- ***DI Protection Type 3 - Gravel bag*** - Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

  1. Construct on gently sloping street.
  2. Leave room upstream of barrier for water to pond and sediment to settle.
  3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.
  4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter*** - Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.
  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

- ***DI Protection Type 5 – Temporary Geotextile Insert (proprietary)*** – Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

- ***DI Protection Type 6 - Biofilter bags*** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.

    1. Construct in a gently sloping area.
    2. Biofilter bags should be placed around inlets to intercept runoff flows.
    3. All bag joints should overlap by 6 in.
    4. Leave room upstream for water to pond and for sediment to settle out.
    5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

- ***DI Protection Type 7 – Compost Socks*** – A compost sock can be assembled on site by filling a mesh sock (e.g., with a pneumatic blower). Compost socks do not require special trenching compared to other sediment control methods (e.g., silt fence). Compost socks should conform to specification detailed in SE-13, Compost Socks and Berms.

Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one year useful life) is $200 per inlet.
- Temporary geotextile inserts are proprietary and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from $50-75 plus installation, but costs can exceed $100. This cost does not include maintenance.
- See SE-13 for Compost Sock cost information.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Silt Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.
- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

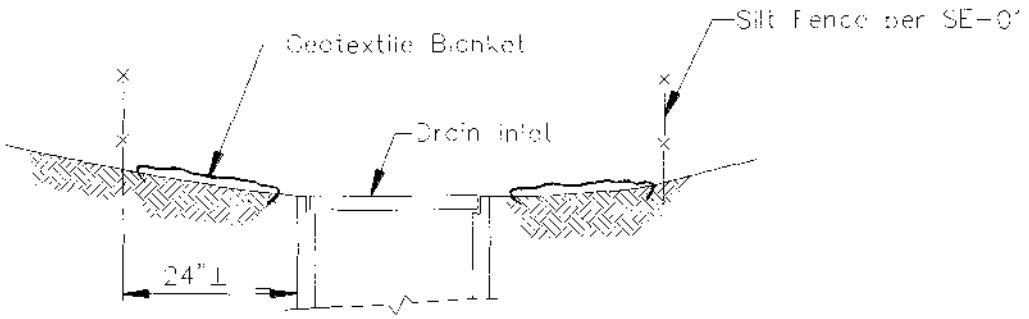
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.
- Remove storm drain inlet protection once the drainage area is stabilized.
  - Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

References

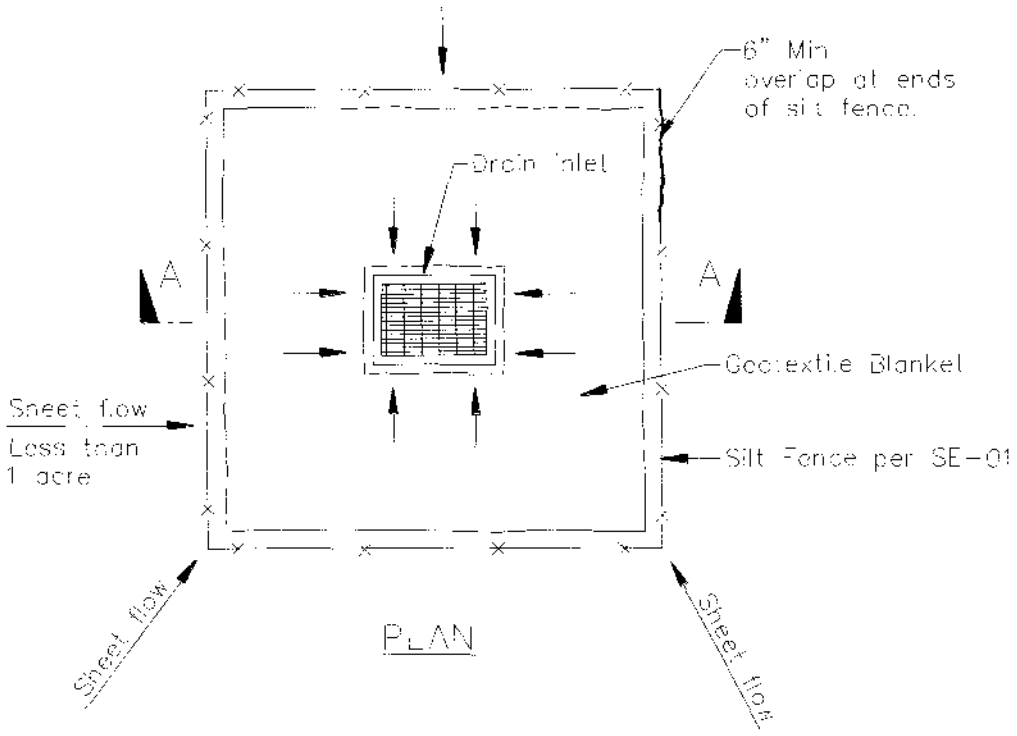
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



SECTION A-A

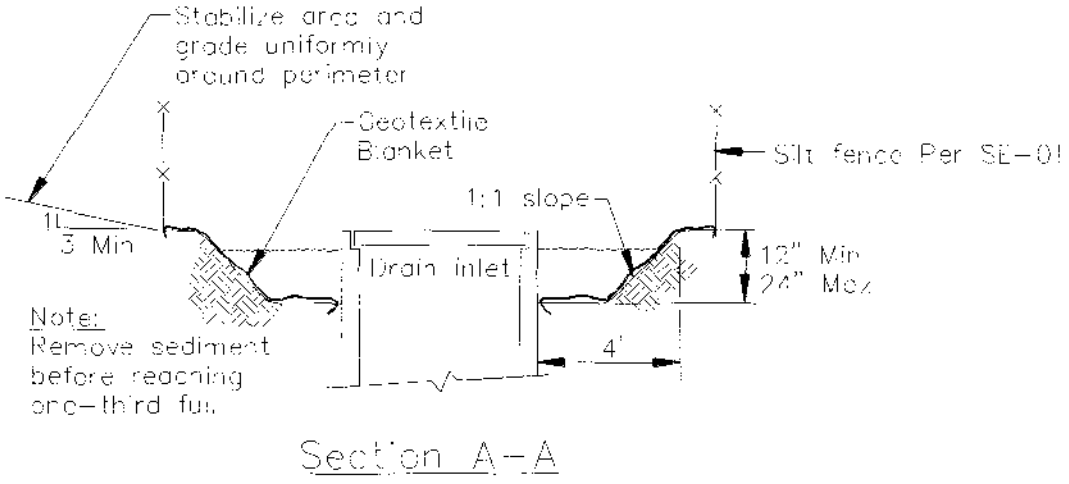


PLAN

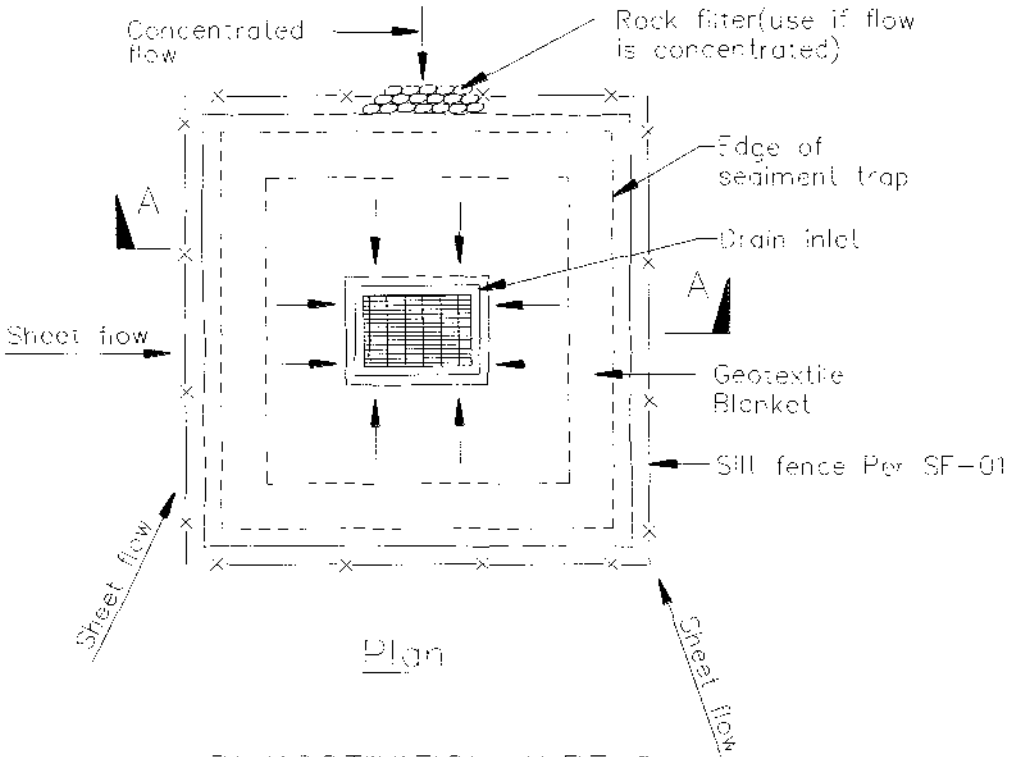
D. PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



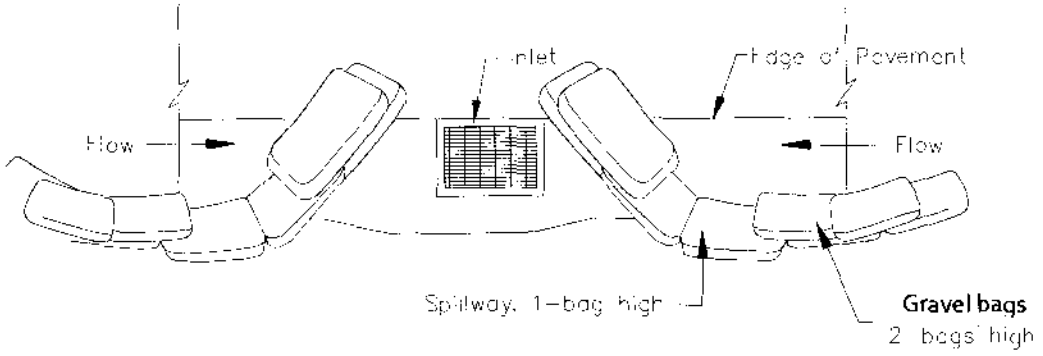
Section A-A



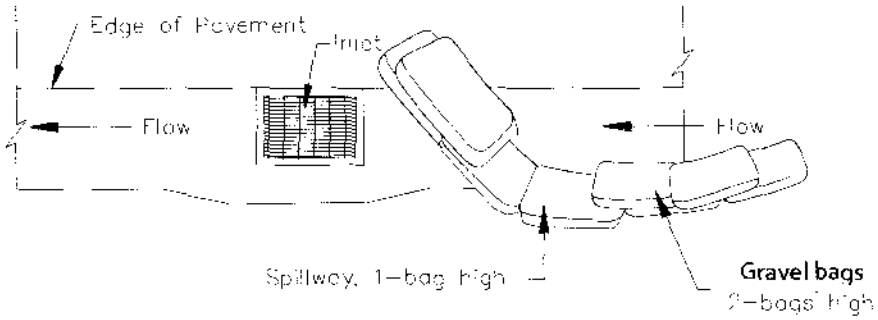
Plan

D' PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP

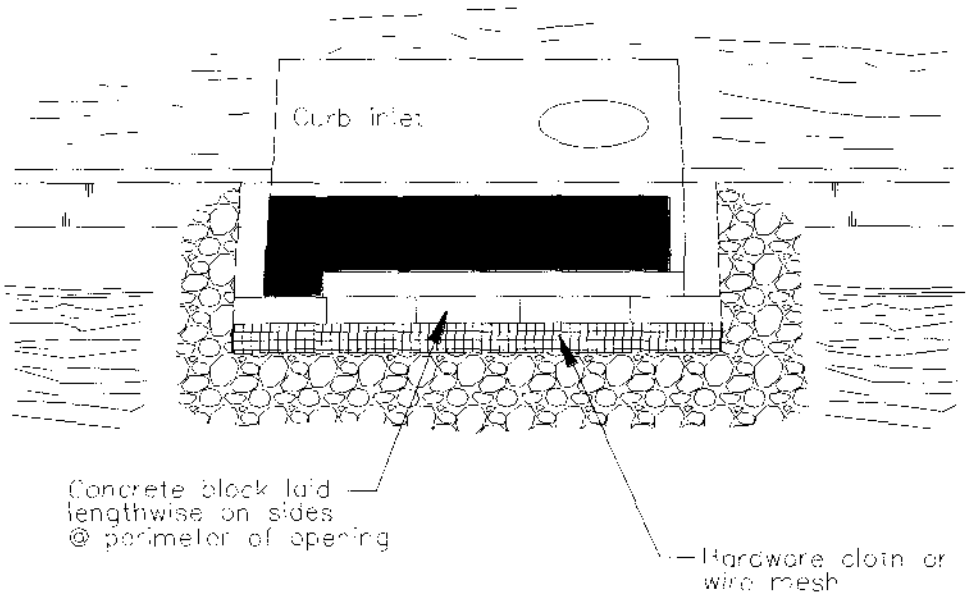


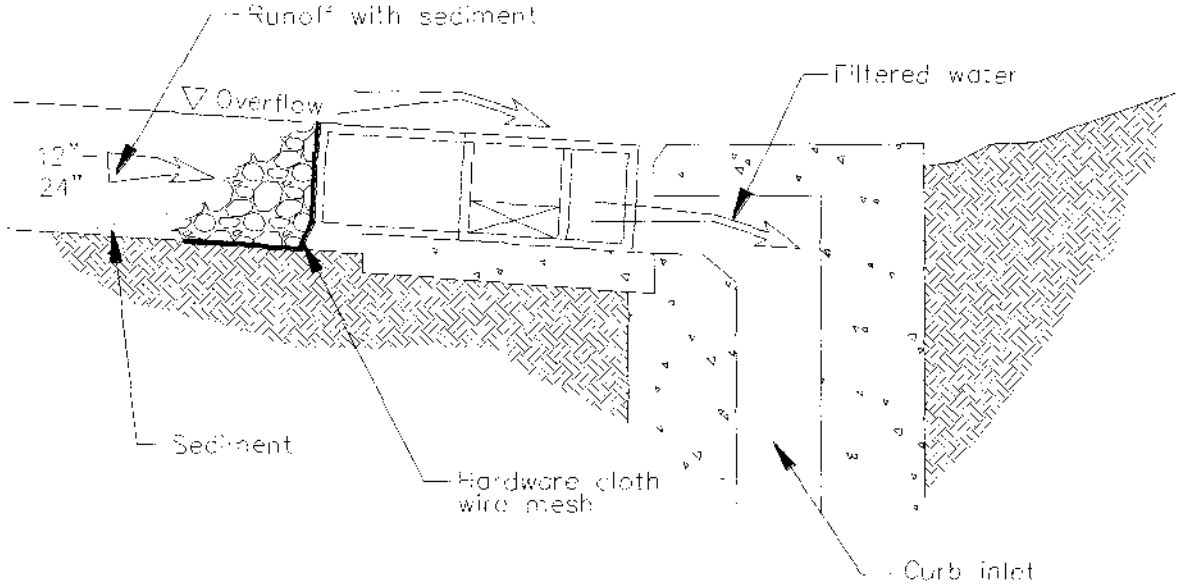
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short term use
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.
6. **Protection can be effective even if it is not immediately adjacent to the inlet provided that the inlet is protected from potential sources of pollution.**

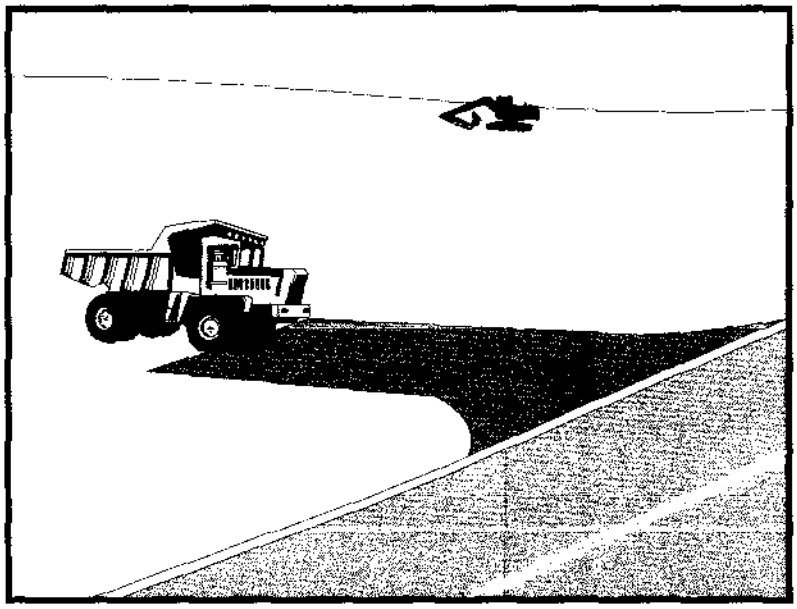
DI PROTECTION TYPE 3
NOT TO SCALE





DI PROTECTION – TYPE 4
NOT TO SCALE

Stabilized Construction Entrance/Exit TC-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Stabilized Construction Entrance/Exit TC-1

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft or maximum site will allow, and 10 ft minimum width or to accommodate traffic.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

Stabilized Construction Entrance/Exit TC-1

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

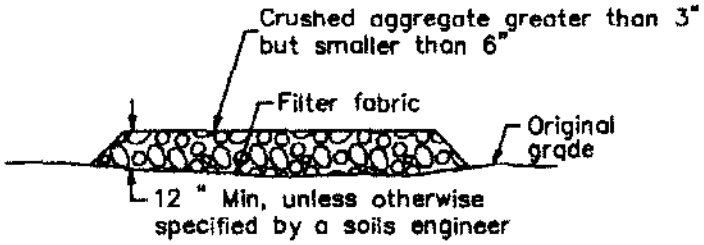
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Stabilized Construction Entrance/Exit TC-1



SECTION B–B
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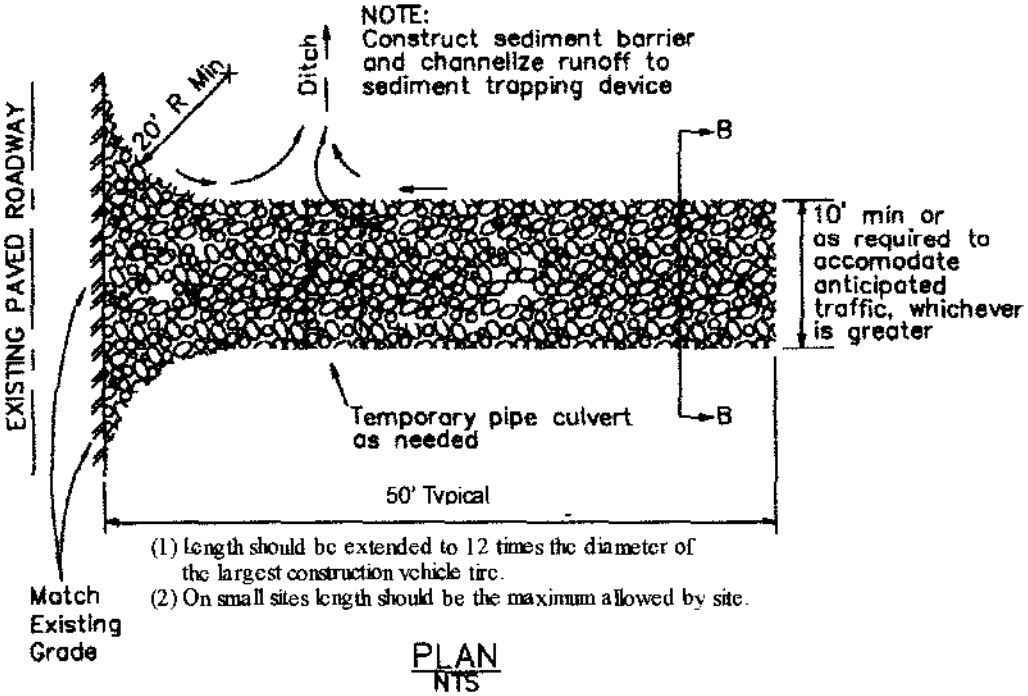
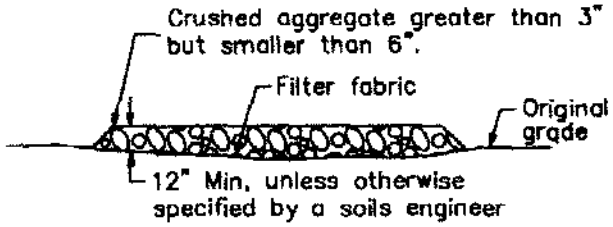


PLAN
NTS

Stabilized Construction Entrance/Exit TC-1



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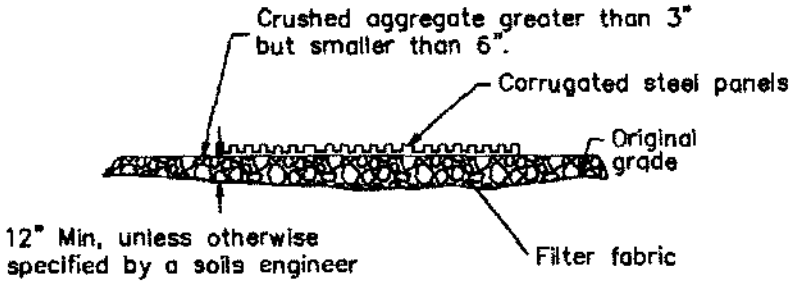
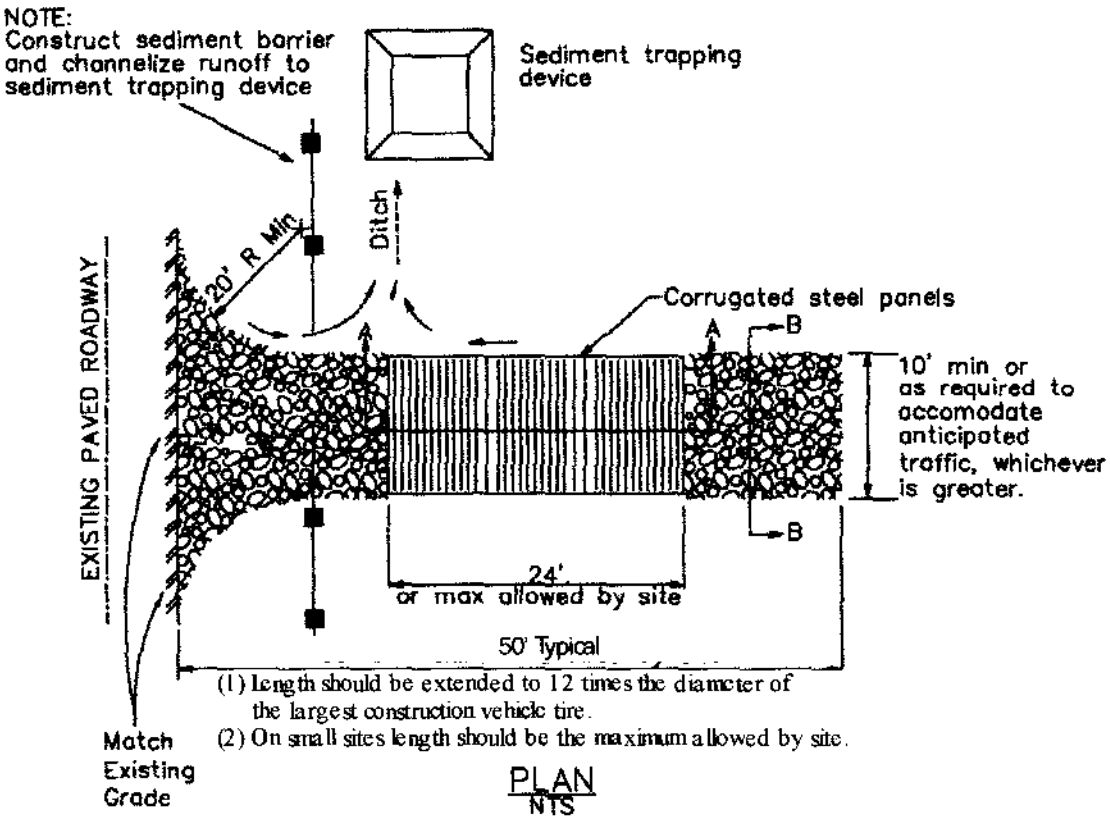
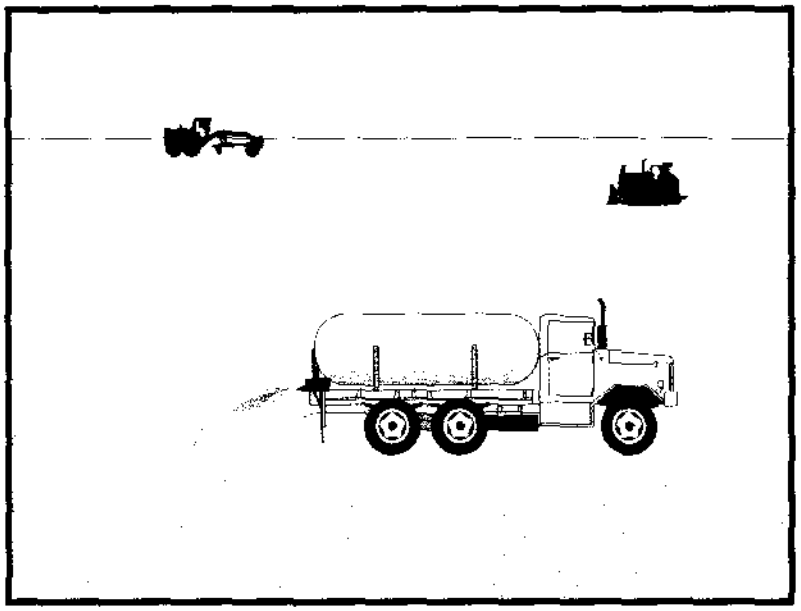


SECTION A–A
NOT TO SCALE



PLAN
NTS

Wind Erosion Control WE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montimorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X			X
Disturbed Areas Subject to Traffic			X	X	X	X		X
Material Stockpiles		X	X	X			X	X
Demolition			X			X	X	
Clearing/ Excavation			X	X				X
Truck Traffic on Unpaved Roads			X	X	X	X	X	
Trackout					X	X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

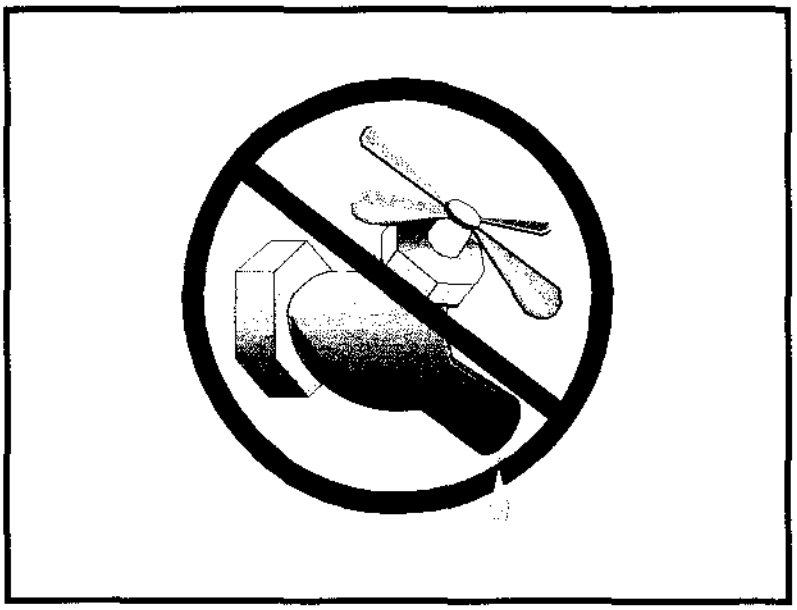
California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Water Conservation Practices NS-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.

- Direct construction water runoff to areas where it can soak into the ground or be collected and reused.
- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

Costs

The cost is small to none compared to the benefits of conserving water.

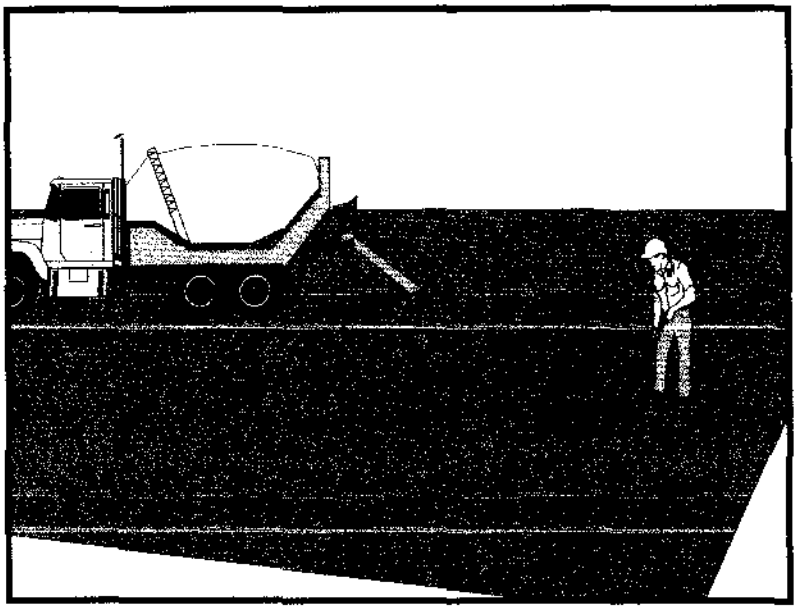
Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occuring.
- Repair water equipment as needed to prevent unintended discharges.
  - Water trucks
  - Water reservoirs (water buffalos)
  - Irrigation systems
  - Hydrant connections

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Paving and Grinding Operations NS-3



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Legend:

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☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

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Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.

  Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

CASQA
CALIFORNIA STORMWATER

Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of)or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:

  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.

  - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).

- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.

- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.

- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.

- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.

- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

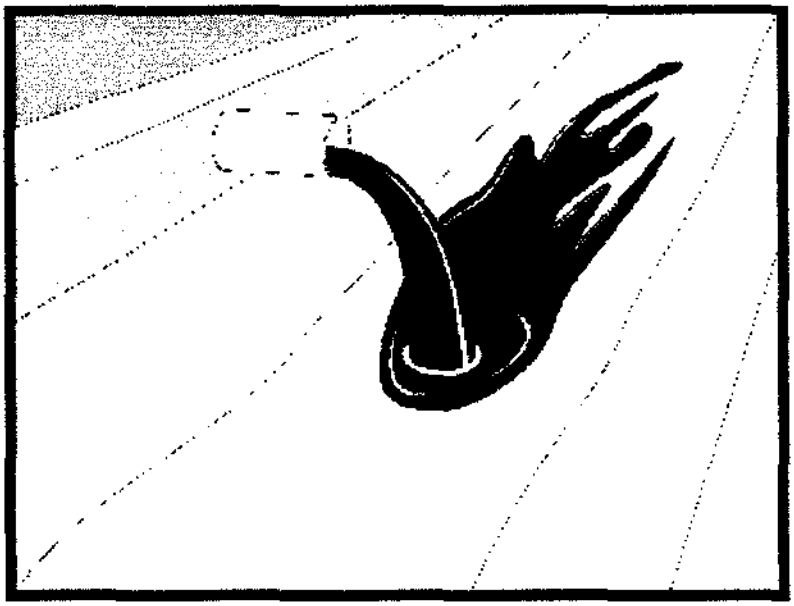
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Illicit Connection/Discharge NS-6



Categories

EC	Erosion Control	
SE	Sediment Control	
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WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.
- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.

- Inspect site regularly during project execution for evidence of illicit connections, illegal dumping or discharges.
- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General** – unlabeled and unidentifiable material should be treated as hazardous.
- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- **Liquids** - signs of illegal liquid dumping or discharge can include:
  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Abnormal water flow during the dry weather season
- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
  - Abnormal water flow during the dry weather season
  - Unusual flows in sub drain systems used for dewatering
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects
- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
  - Abnormal water flow during the non-irrigation season
  - Non-standard junction structures
  - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect the site regularly to check for any illegal dumping or discharge.
- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.
- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

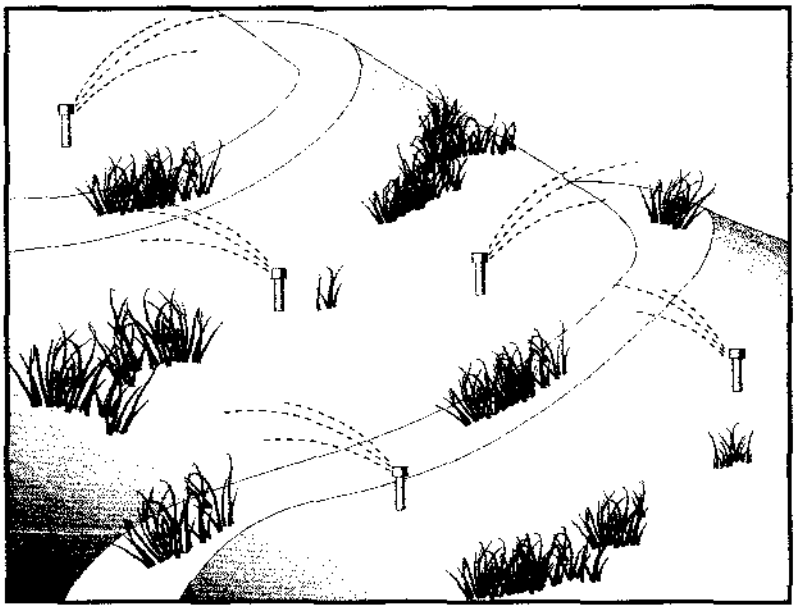
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Potable Water/Irrigation NS-7



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.

- Inspect irrigated areas within the construction limits for excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Repair broken water lines as soon as possible.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

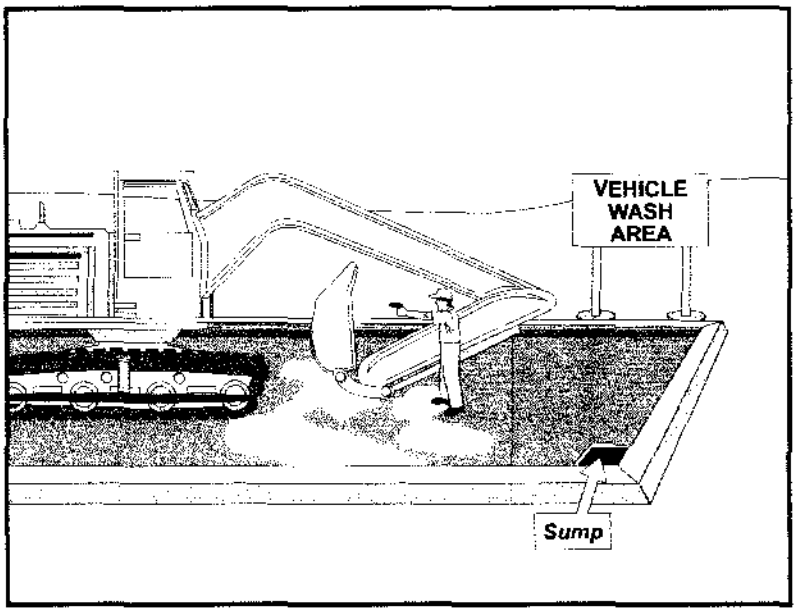
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle and Equipment Cleaning NS-8



Categories

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SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

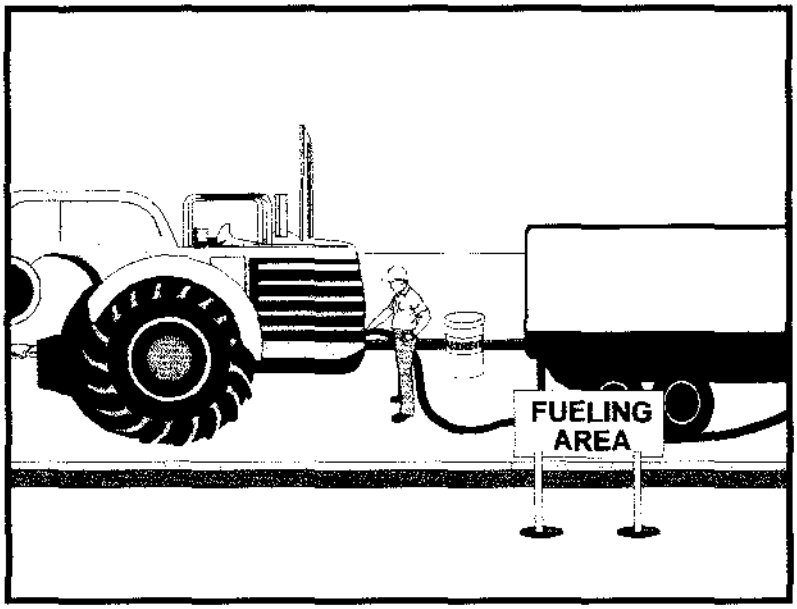
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.

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- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

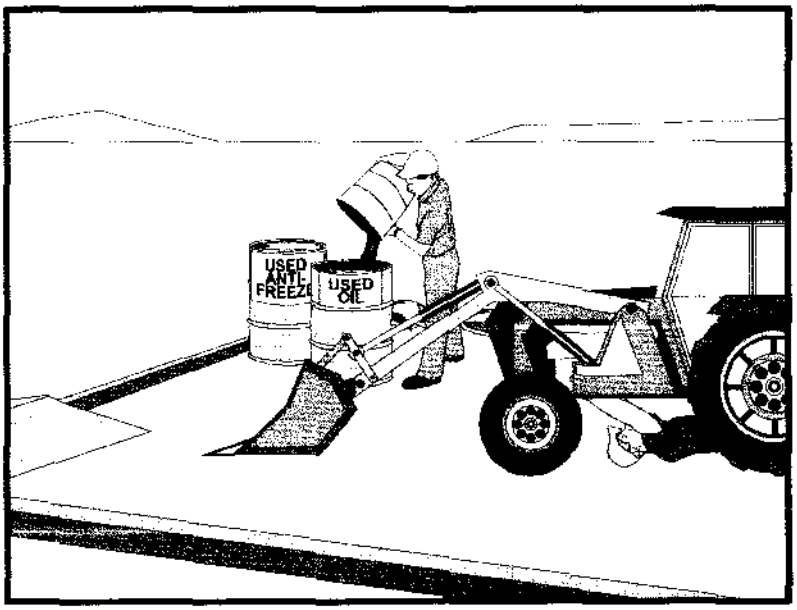
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Categories

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WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8,

Vehicle & Equipment Maintenance NS-10

Vehicle and Equipment Cleaning, and NS-9, Vehicle and Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Vehicle & Equipment Maintenance NS-10

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

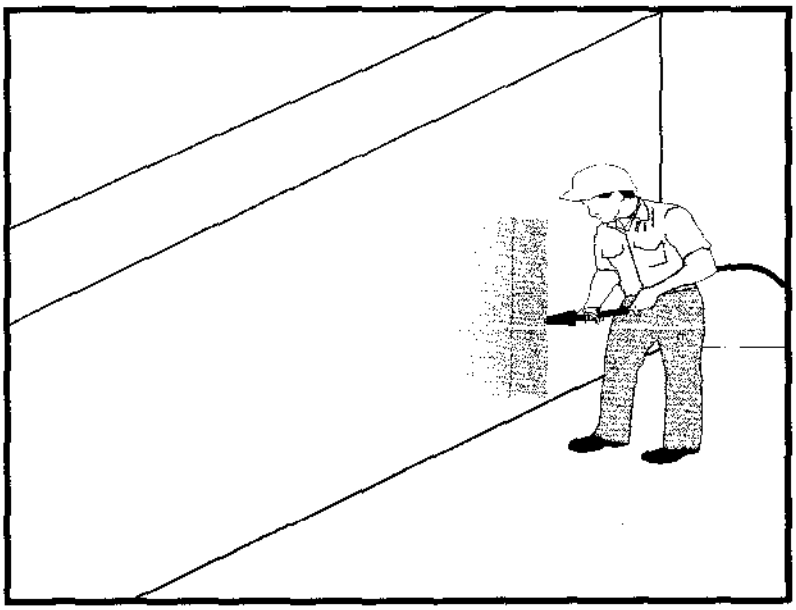
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Concrete Curing NS-12



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete and its associated curing materials have basic chemical properties that can raise the pH of water to levels outside of the permitted range. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Proper procedures and care should be taken when managing concrete curing materials to prevent them from coming into contact with stormwater flows, which could result in a high pH discharge.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

Chemical Curing

- Avoid over spray of curing compounds.
- Minimize the drift by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.
- Protect drain inlets prior to the application of curing compounds.
- Refer to WM-4, Spill Prevention and Control.

Water Curing for Bridge Decks, Retaining Walls, and other Structures

- Direct cure water away from inlets and watercourses to collection areas for evaporation or other means of removal in accordance with all applicable permits. See WM-8 Concrete Waste Management.
- Collect cure water at the top of slopes and transport to a concrete waste management area in a non-erosive manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Education

- Educate employees, subcontractors, and suppliers on proper concrete curing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete curing procedures.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Sample non-stormwater discharges and stormwater runoff that contacts uncured and partially cured concrete as required by the General Permit.
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

References

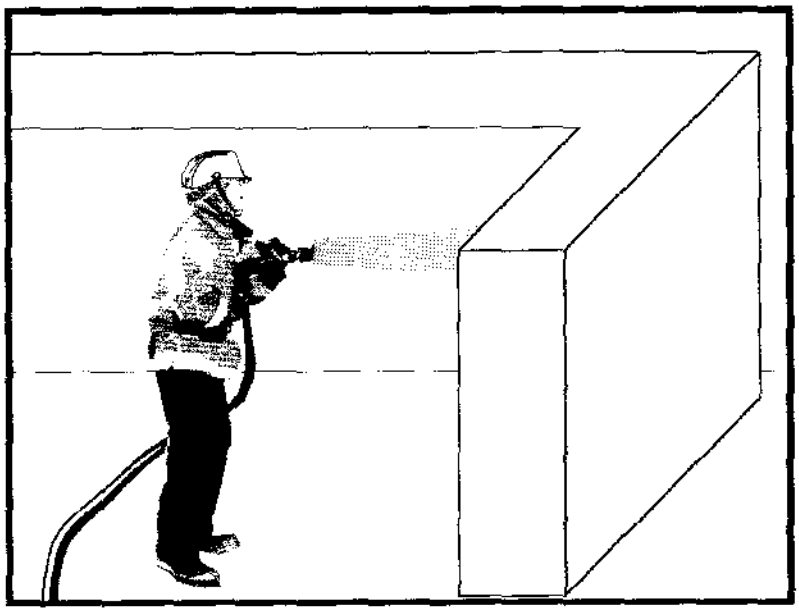
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Concrete Finishing NS-13



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Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete finishing procedures.

Costs

These measures are generally of low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

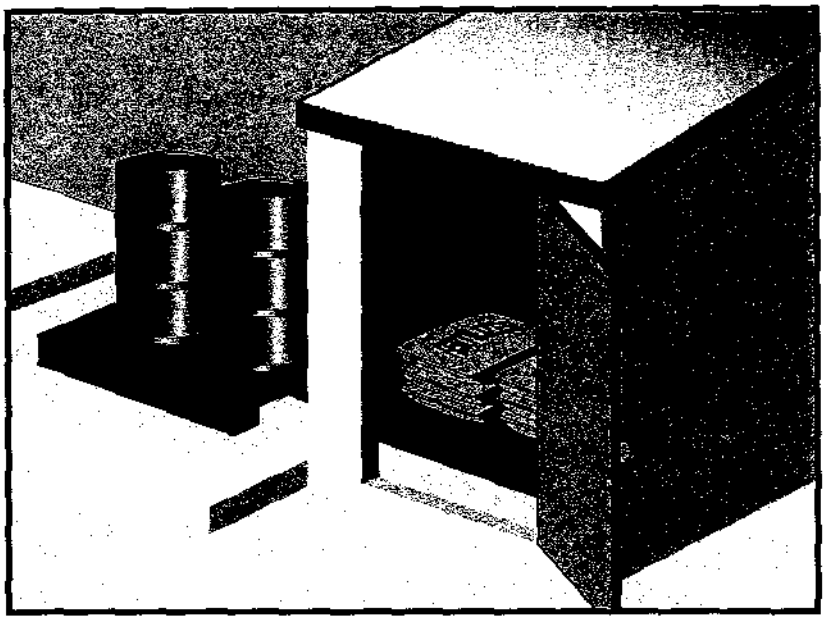
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Material Delivery and Storage WM-1



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

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- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

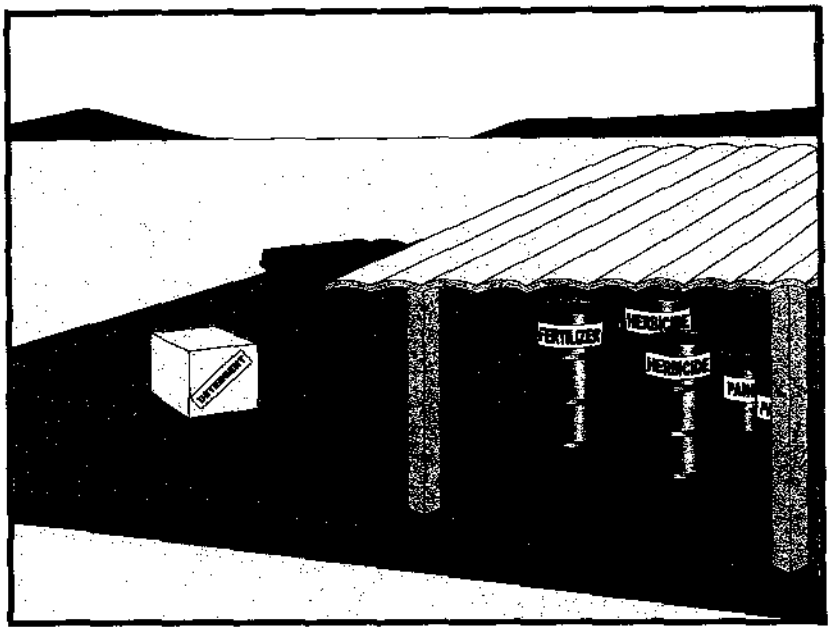
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Material Use

WM-2



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

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Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

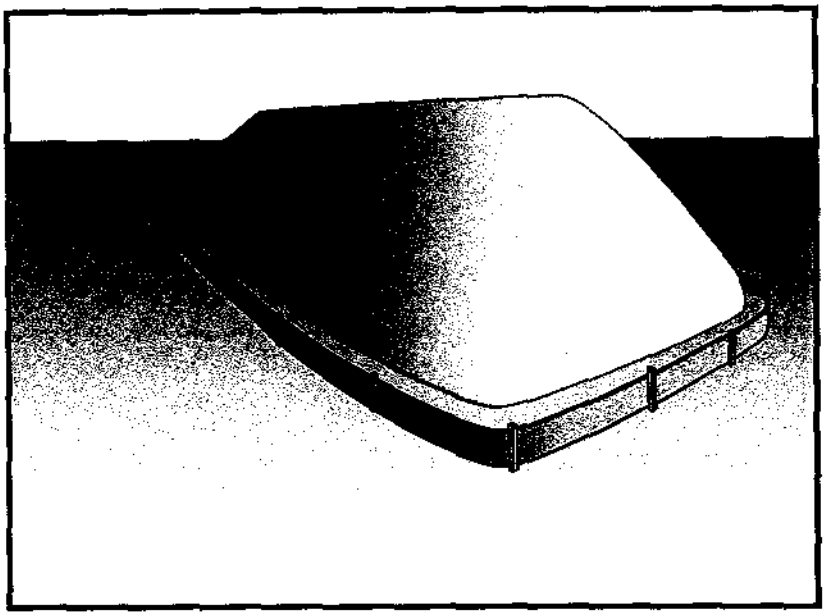
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management WM-3



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of Plastic materials and photodegradable plastics should be avoided.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

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- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- All stockpiles are required to be protected immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater runon using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Temporary vegetation should be considered for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Stockpiles should be covered and protected with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cold mix stockpiles should be placed on and covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Stockpiles of fly ash, stucco, hydrated lime

- Stockpiles of materials that may raise the pH of runoff (i.e., basic materials) should be covered with plastic and surrounded by a berm.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate

- Treated wood should be covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

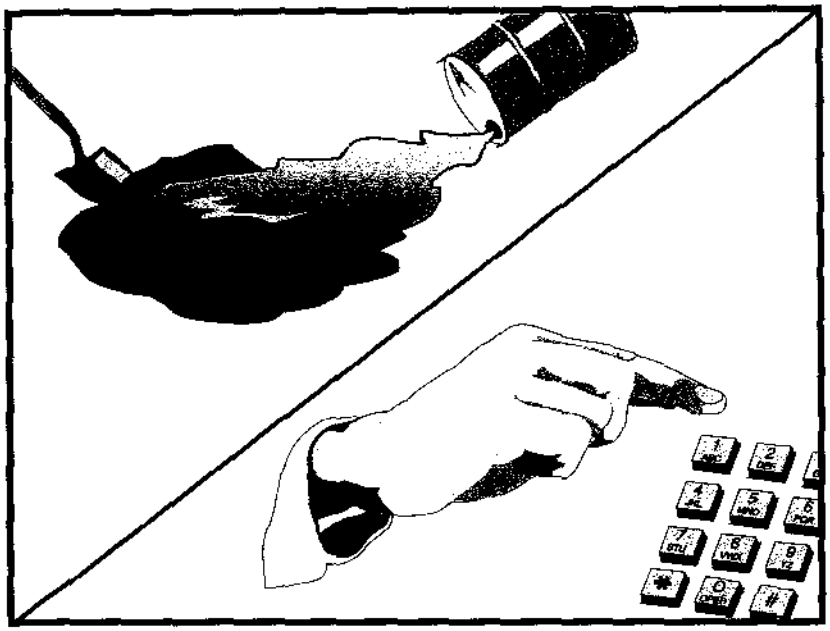
Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Spill Prevention and Control WM-4



Categories

EC	Erosion Control	
SE	Sediment Control	
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WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

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- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

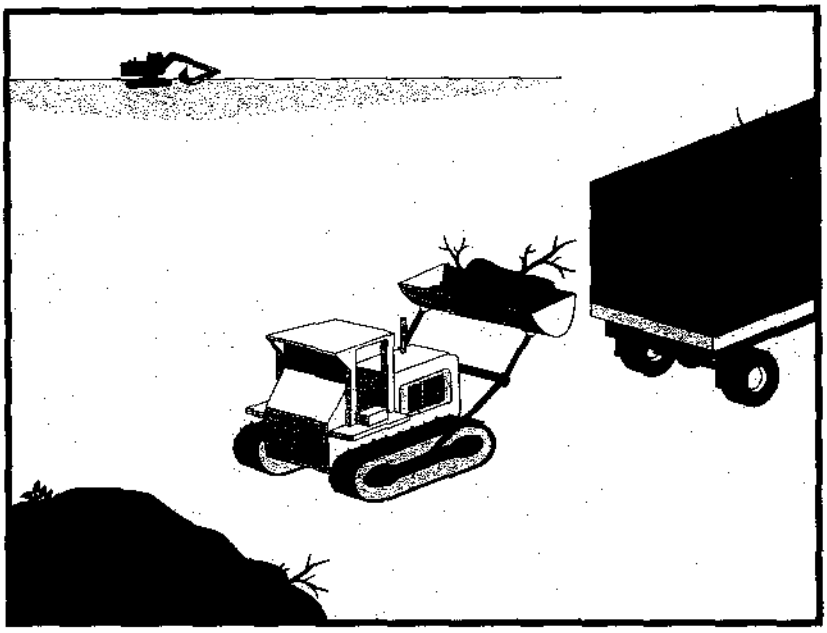
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Solid Waste Management WM-5



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials
- Highway planting wastes, including vegetative material,

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plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

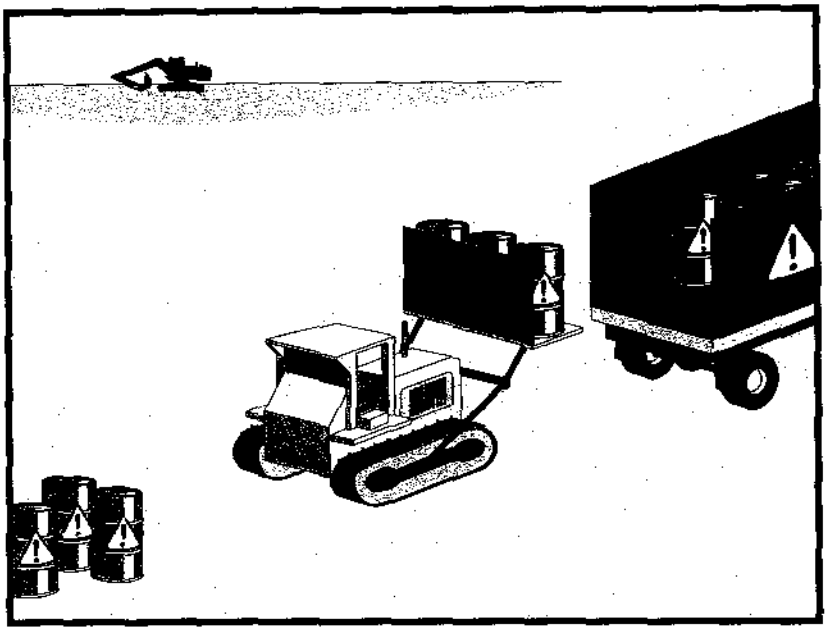
References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Hazardous Waste Management WM-6



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Asphalt Products
- Concrete Curing Compounds
- Pesticides
- Palliatives
- Acids
- Septic Wastes
- Paints
- Stains
- Solvents
- Wood Preservatives
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

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In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

- Drums should not be overfilled and wastes should not be mixed.
- Unless watertight, containers of dry waste should be stored on pallets.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.
- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.
- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.
- The following actions should be taken with respect to temporary contaminant:
  - Ensure that adequate hazardous waste storage volume is available.
  - Ensure that hazardous waste collection containers are conveniently located.
  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
  - Minimize production or generation of hazardous materials and hazardous waste on the job site.
  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.
  - Segregate potentially hazardous waste from non-hazardous construction site debris.
  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.
- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

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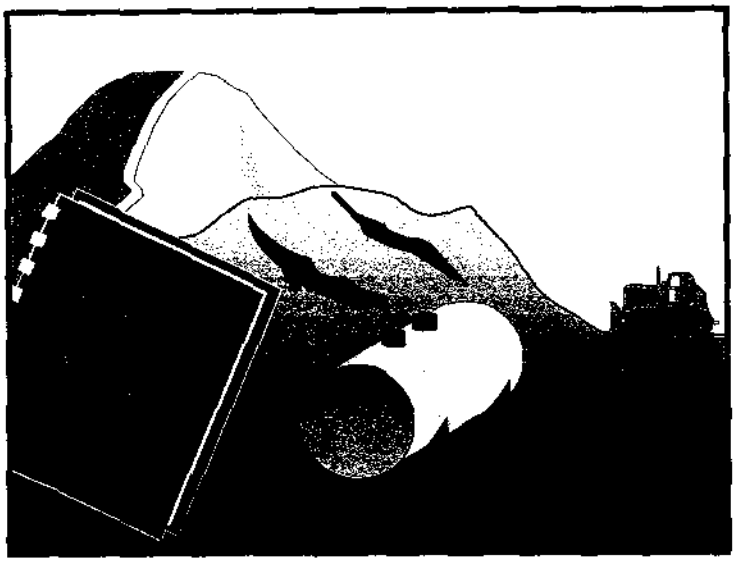
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Contaminated Soil Management WM-7



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- The contractor may further identify contaminated soils by investigating:
  - Past site uses and activities
  - Detected or undetected spills and leaks
  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements
  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
  - Suspected soils should be tested at a certified laboratory.

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations should result in no visible dust.
- Caution should be exercised to prevent spillage of lead containing material during transport.

- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.
- Test suspected soils at an approved certified laboratory.
- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- Take the following precautions if temporary stockpiling is necessary:
  - Cover the stockpile with plastic sheeting or tarps.
  - Install a berm around the stockpile to prevent runoff from leaving the area.
  - Do not stockpile in or near storm drains or watercourses.
- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat or dispose of it at an appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavate, transport, and dispose of contaminated material and hazardous material in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
  - United States Department of Transportation (USDOT)
  - United States Environmental Protection Agency (USEPA)
  - California Environmental Protection Agency (CAL-EPA)

- California Division of Occupation Safety and Health Administration (CAL-OSHA)
- Local regulatory agencies

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Costs

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

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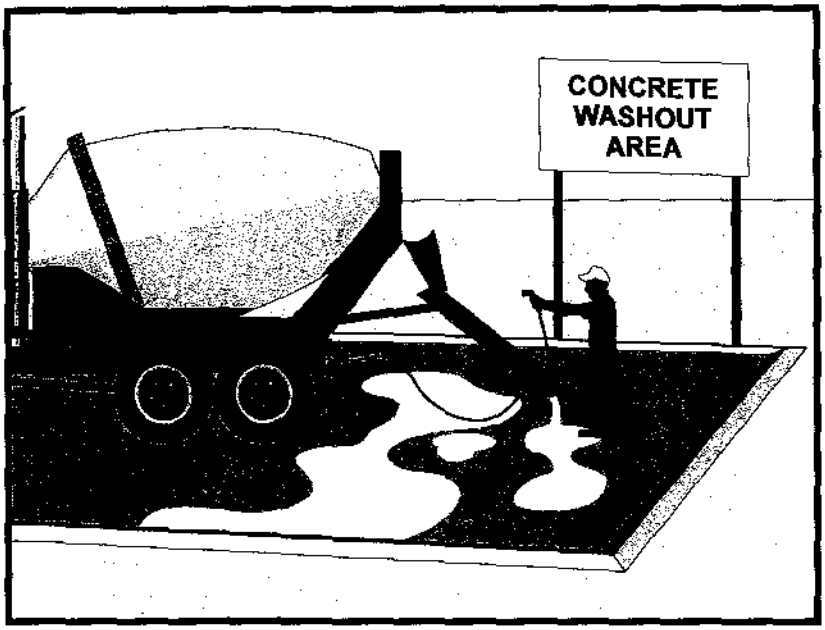
Concrete Waste Management WM-8



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.

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- Concrete trucks and other concrete-coated equipment are washed onsite.
- Mortar-mixing stations exist.
- Stucco mixing and spraying .
- See also NS-8, Vehicle and Equipment Cleaning.

Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
  - Washout should be lined so there is no discharge into the underlying soil.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- See typical concrete washout installation details at the end of this fact sheet.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.
- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

Concrete Demolition Wastes

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.
- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).
- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.
- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
  - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
  - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
  - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a "roll-off"; this concrete washout facility should be properly sealed to prevent leakage, and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
  - Lath and flagging should be commercial type.
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations..

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures. Roll-off concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.

- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

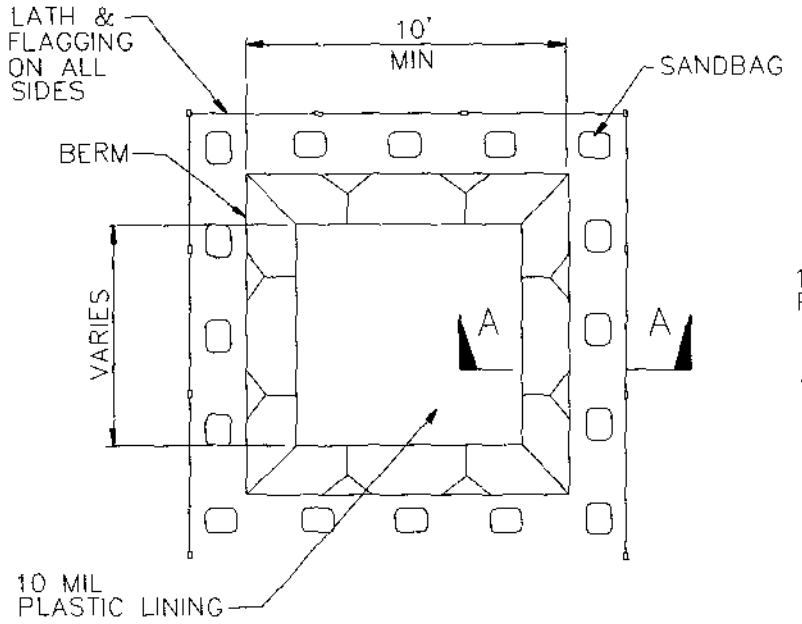
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

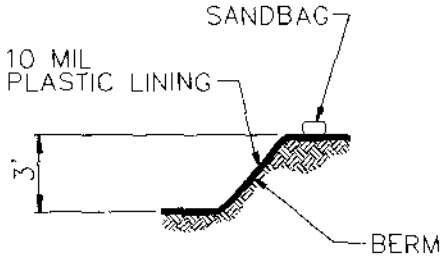
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

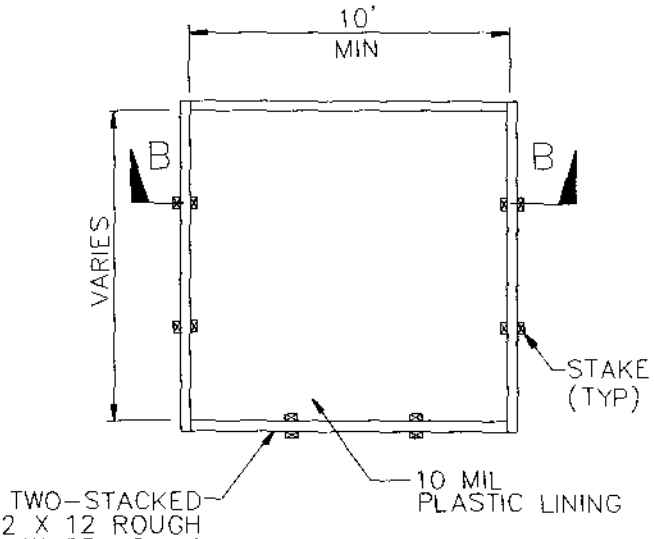
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



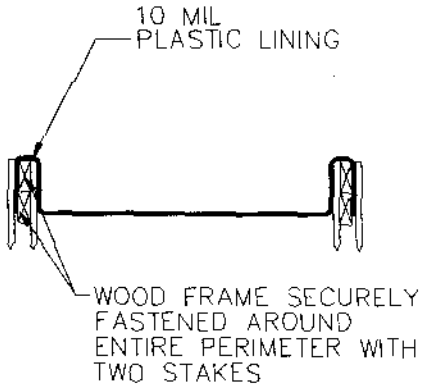
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



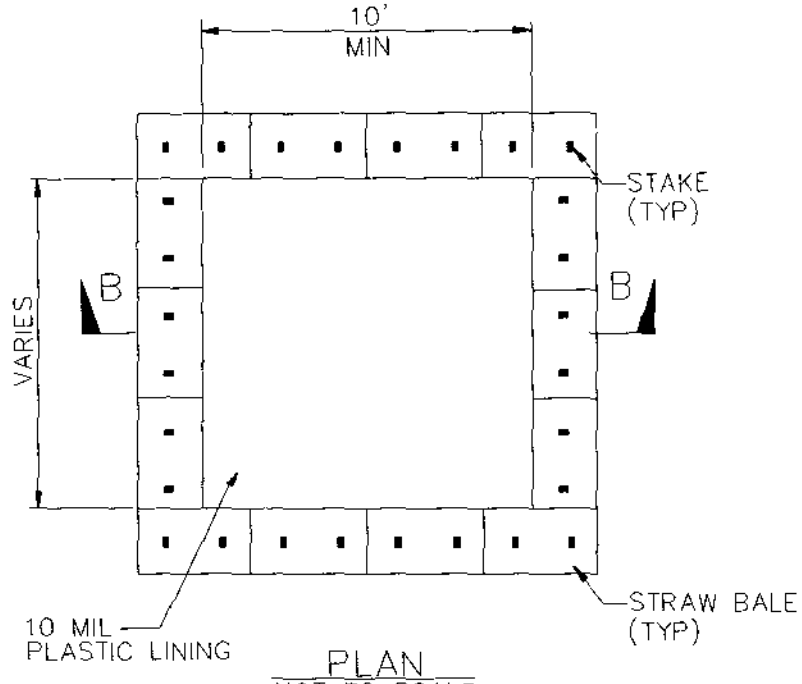
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



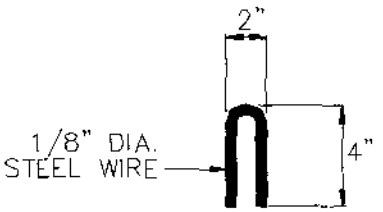
SECTION B–B
NOT TO SCALE

NOTES

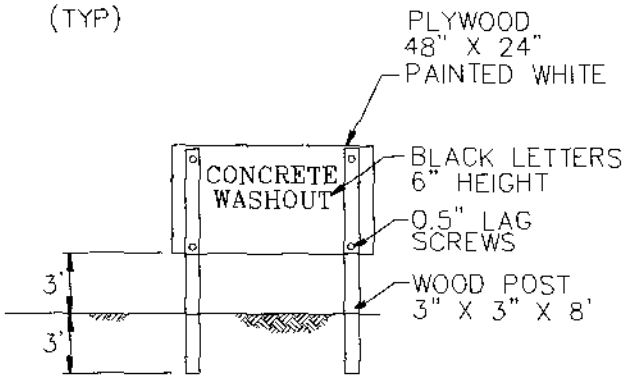
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



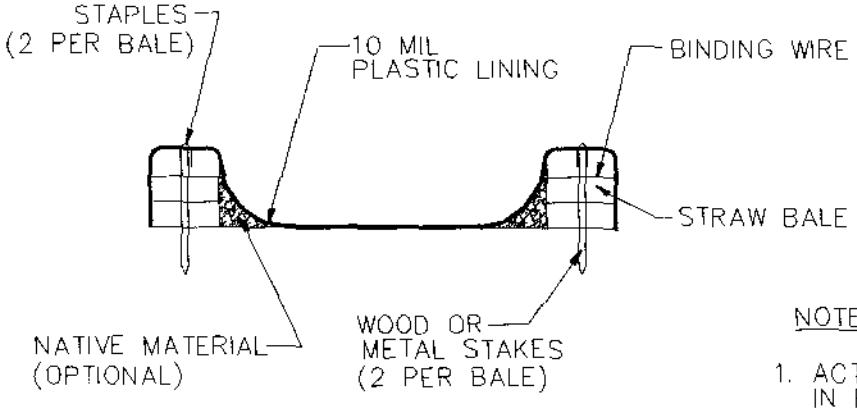
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)

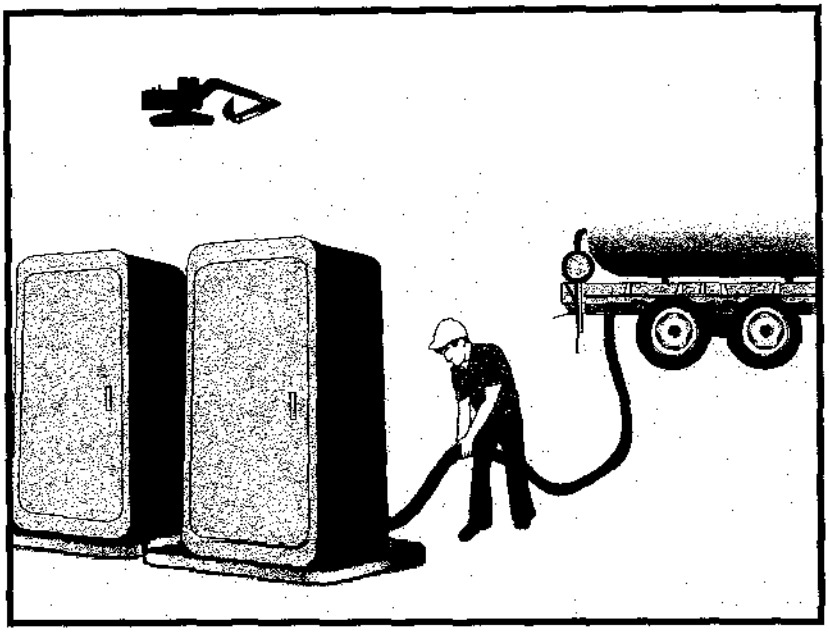


SECTION B-B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Sanitary/Septic Waste Management WM-9



Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

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- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Inspection and Maintenance

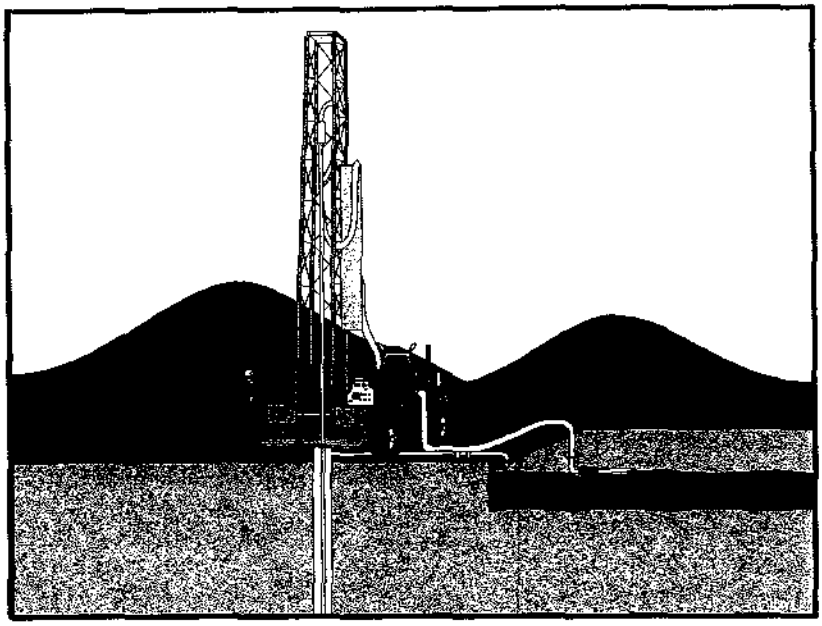
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Liquid Waste Management WM-10



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous wastes (WM-6, Hazardous Waste Management), or concrete slurry residue (WM-8, Concrete Waste

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Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

Implementation

General Practices

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.
- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.
- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.
- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.

- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.

- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.

- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.

- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Costs

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.
- Inspect containment areas and capturing devices and repair as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

APPENDIX F

Construction Activity Schedule

APPENDIX G

Monitoring Record for Inspection Checklists Included in Appendix 'C'

APPENDIX H

Storm Water Requirements Applicability Checklist

City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

THE CITY OF SAN DIEGO

Storm Water Requirements Applicability Checklist

FORM DS-560
JANUARY 2011

Project Address:	Project Number *(for City Use Only)*:
4206 Chamoune Avenue	

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

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)*: Brent Moore - Alidade Engineering	Title: Vice President
Signature:	Date: 7/10/13

WATER POLLUTION CONTROL PLAN
FIRE STATION NO. 17

EROSION CONTROL NOTES:

1. IN CASE EMERGENCY WORK IS REQUIRED, CONTACT _____ FROM _____ AT _____
2. DEVICES SHOWN ON CITY APPROVED PLANS SHALL NOT BE MOVED OR MODIFIED WITHOUT THE APPROVAL OF THE ENGINEERING INSPECTOR.
3. THE CONTRACTOR SHALL RESTORE ALL EROSION CONTROL DEVICES TO WORKING ORDER TO THE SATISFACTION OF THE CITY ENGINEER AFTER EACH RUN-OFF PRODUCING RAINFALL.
4. THE CONTRACTOR SHALL INSTALL ADDITIONAL EROSION CONTROL MEASURES AS MAY BE REQUIRED BY THE CITY ENGINEER DUE TO UNCOMPLETED GRADING OPERATIONS OR UNFORESEEN CIRCUMSTANCES WHICH MAY ARISE.
5. THE CONTRACTOR SHALL BE RESPONSIBLE AND SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT PUBLIC TRESPASS ONTO AREAS WHERE IMPOUNDED WATERS CREATE A HAZARDOUS CONDITION.
6. GRADED AREAS AROUND THE PROJECT PERIMETER MUST DRAIN AWAY FROM THE FACE OF SLOPE AT THE CONCLUSION OF EACH WORKING DAY.
7. ALL REMOVABLE PROTECTIVE DEVICES SHOWN SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN THE FIVE (5) DAY RAIN PROBABILITY FORECAST EXCEEDS FORTY PERCENT (40%). SILT AND OTHER DEBRIS SHALL BE REMOVED AFTER EACH RAINFALL.
8. ALL GRAVEL BAGS SHALL BE BURLAP TYPE WITH 3/4 INCH MINIMUM AGGREGATE.
9. ALL GRADED AREAS MUST HAVE EROSION CONTROL PROTECTION BEST MANAGEMENT PRACTICE MEASURES PROPERLY INSTALLED.
10. ADEQUATE PERIMETER PROTECTION BEST MANAGEMENT PRACTICE MEASURES MUST BE INSTALLED AND MAINTAINED.
11. ADEQUATE SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES MUST BE INSTALLED AND MAINTAINED.
12. ADEQUATE MEASURES TO CONTROL OFFSITE SEDIMENT TRACKING MUST BE INSTALLED AND MAINTAINED.
13. A MINIMUM OF 125% OF THE MATERIAL NEEDED TO INSTALL STANDBY BEST MANAGEMENT PRACTICE MEASURES TO PROTECT THE EXPOSED AREAS FROM EROSION AND PREVENT SEDIMENT DISCHARGES, MUST BE STORED ONSITE. AREAS ALREADY PROTECTED FROM EROSION USING PHYSICAL STABILIZATION OR ESTABLISHED VEGETATION STABILIZATION MEASURES ARE NOT CONSIDERED TO BE "EXPOSED" FOR PURPOSES OF THIS REQUIREMENT.
14. THE OWNER/DEVELOPER/CONTRACTOR MUST HAVE AN APPROVED "WEATHER TRIGGERED" ACTION PLAN AND BE ABLE TO DEPLOY STANDBY BEST MANAGEMENT PRACTICE MEASURES TO COMPLETELY PROTECT THE EXPOSED PORTIONS OF THE SITE WITHIN 48 HOURS OF A PREDICTED STORM EVENT (A PREDICTED STORM EVENT IS DEFINED AS A FORECASTED, 40% CHANCE OF RAIN BY THE NATIONAL WEATHER SERVICE). ON REQUEST, THE OWNER/CONTRACTOR MUST PROVIDE PROOF OF THIS CAPABILITY THAT IS ACCEPTABLE TO THE CITY.
15. DEPLOYMENT OF PHYSICAL OR VEGETATION EROSION CONTROL MEASURES MUST COMMENCE AS SOON AS SLOPES ARE COMPLETED. THE OWNER/CONTRACTOR MAY NOT CONTINUE TO RELY ON THE ABILITY TO DEPLOY STANDBY BEST MANAGEMENT PRACTICE MATERIALS TO PREVENT EROSION OF SLOPES THAT HAVE BEEN COMPLETED.
16. UNLESS OTHERWISE SPECIFIED ON THE GRADING PLANS OR THE CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN DOCUMENTS, THE AREA THAT CAN BE CLEARED, GRADED, AND LEFT EXPOSED AT ONE TIME IS LIMITED TO THE AMOUNT OF ACREAGE THAT THE CONTRACTOR CAN ADEQUATELY PROTECT PRIOR TO A PREDICTED RAINSTORM. IT MAY BE NECESSARY TO DEPLOY EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES IN AREAS THAT ARE NOT COMPLETED AND ARE NOT ACTIVELY BEING WORKED BEFORE ADDITIONAL GRADING IS ALLOWED TO PROCEED, AT THE DISCRETION OF THE PUBLIC WORKS INSPECTOR.

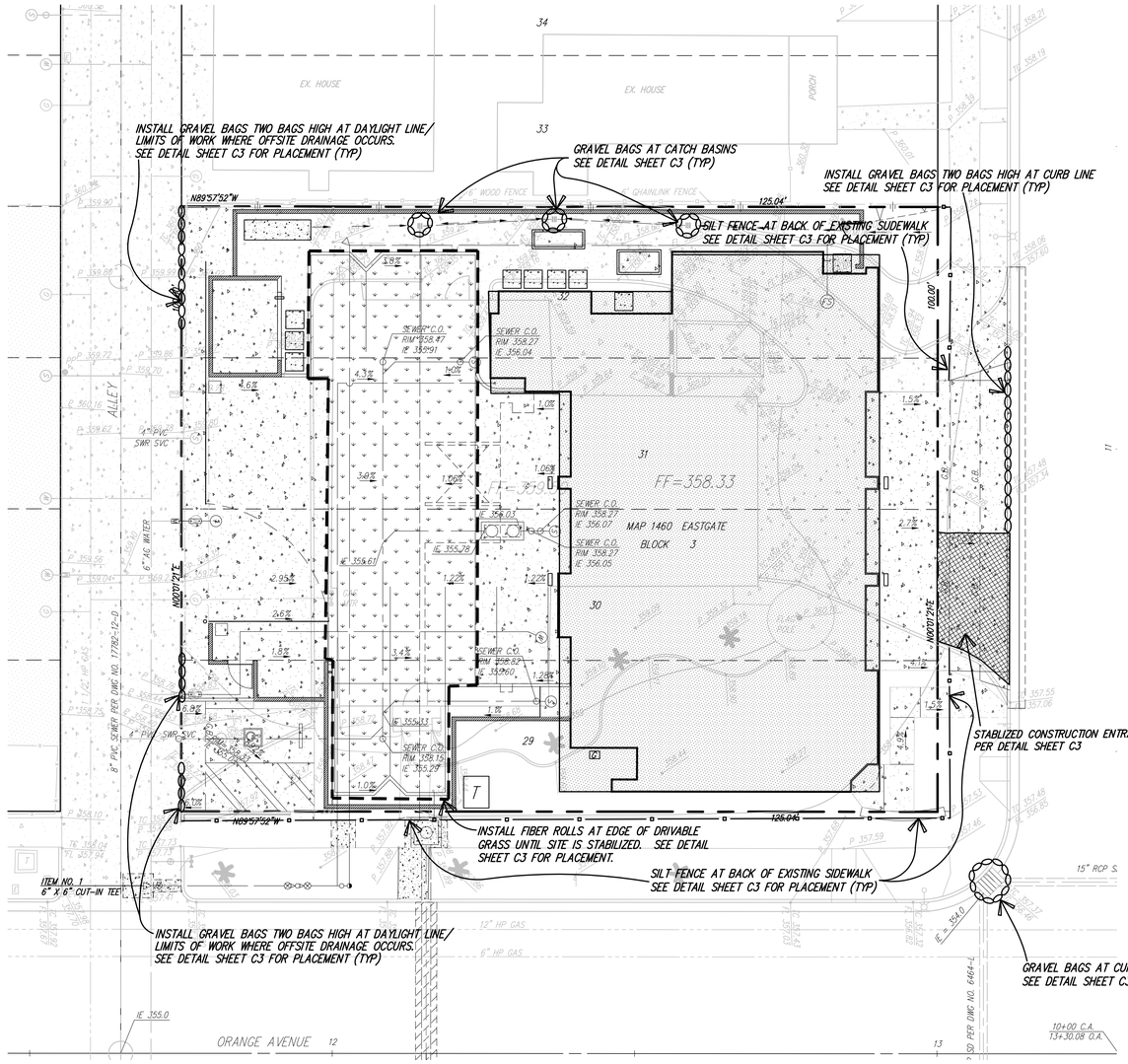
RAINY SEASON SITE MANAGEMENT REQUIREMENTS (OCTOBER 1 – APRIL 30)

THE FOLLOWING RAINY SEASON SITE MANAGEMENT REQUIREMENTS SHALL BE ADHERED TO THROUGHOUT THE RAINY SEASON DEFINED AS BEGINNING ON OCTOBER 1 OF ANY YEAR AND EXTENDING THROUGH APRIL 30TH OF THE FOLLOWING YEAR:

1. EROSION CONTROL, PERIMETER PROTECTION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES MUST BE UPGRADED IF NECESSARY TO PROVIDE SUFFICIENT PROTECTION FOR STORMS LIKELY TO OCCUR DURING THE RAINY SEASON.
2. EQUIPMENT AND WORKERS FOR EMERGENCY WORK SHALL BE MADE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON. ALL NECESSARY MATERIALS SHALL BE STOCKPILED ON SITE AT CONVENIENT LOCATIONS TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES WHEN RAIN IS EMINENT.
3. ADEQUATE PHYSICAL OR VEGETATION EROSION CONTROL BEST MANAGEMENT PRACTICE MEASURES MUST BE INSTALLED AND ESTABLISHED FOR ALL COMPLETED SLOPES PRIOR TO THE START OF THE RAINY SEASON. THESE BEST MANAGEMENT PRACTICE MEASURES MUST BE MAINTAINED THROUGHOUT THE RAINY SEASON. IF A SELECTED BEST MANAGEMENT PRACTICE MEASURE FAILS, IT MUST BE REPAIRED AND IMPROVED, OR REPLACED WITH AN ACCEPTABLE ALTERNATE AS SOON AS IT IS SAFE TO DO SO. THE FAILURE OF A BEST MANAGEMENT PRACTICE MEASURE INDICATES IT WAS NOT ADEQUATE FOR THE CIRCUMSTANCES IN WHICH IT WAS USED. REPAIRS OR REPLACEMENTS MUST THEREFORE PUT A MORE ROBUST BEST MANAGEMENT PRACTICE MEASURE IN PLACE.
4. ALL VEGETATION EROSION CONTROL MUST BE ESTABLISHED PRIOR TO THE RAINY SEASON TO BE CONSIDERED AS A BEST MANAGEMENT PRACTICE MEASURE.
5. THE AMOUNT OF EXPOSED SOIL ALLOWED AT ONE TIME SHALL NOT EXCEED THAT WHICH CAN BE ADEQUATELY PROTECTED BY DEPLOYING STANDBY EROSION CONTROL AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES PRIOR TO A PREDICTED RAINSTORM.
6. A DISTURBED AREA THAT IS NOT COMPLETED BY THAT IS NOT BEING ACTIVELY GRADED MUST BE FULLY PROTECTED FROM EROSION IF LEFT FOR 10 OR MORE DAYS. THE ABILITY TO DEPLOY STANDBY BEST MANAGEMENT PRACTICE MEASURE MATERIALS IS NOT SUFFICIENT FOR THESE AREAS. BEST MANAGEMENT PRACTICE MEASURES MUST ACTUALLY BE DEPLOYED.

STORM WATER QUALITY NOTES – CONSTRUCTION BMP'S

1. THIS PROJECT SHALL COMPLY WITH ALL REQUIREMENTS OF THE STATE PERMIT: CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO REGION, ORDER NO. 2009-0009-DWQ NPDES NO. CAS0000002 (AVAILABLE AT HTTP://WWW.SWRCB.CA.GOV/RWQCB9/PROGRAMS/SD_STORMWATER.HTML) AND THE CITY OF SAN DIEGO LAND DEVELOPMENT CODE (HTTP://CLERKDOC.SANNET.GOV/LEGTRAIN/MC/MUNICODECHAPTER14/CH14ART2DIVISION02 AND HTTP://WWW.SANDIEGO.GOV/DEVELOPMENT-SERVICES/NEWS/PDF/STORMWATERMANUAL.PDF). NOTES BELOW REPRESENT KEY MINIMUM REQUIREMENTS FOR CONSTRUCTION BMP'S.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANUP OF ALL SILT AND MUD ON ADJACENT STREET(S), DUE TO CONSTRUCTION VEHICLES OR ANY OTHER CONSTRUCTION ACTIVITY. AT THE END OF EACH WORK DAY, OR AFTER A STORM EVENT THAT CAUSES A BREACH IN INSTALLED CONSTRUCTION BMP'S WHICH MAY COMPROMISE STORM WATER QUALITY WITHIN ANY STREET(S). A STABILIZED CONSTRUCTION EXIT MAY BE REQUIRED TO PREVENT CONSTRUCTION VEHICLES OR EQUIPMENT FROM TRACKING MUD OR SILT ONTO THE STREET.
3. ALL STOCK PILES OF SOIL AND/OR BUILDING MATERIALS THAT ARE INTENDED TO BE LEFT FOR A PERIOD GREATER THAN SEVEN CALENDAR DAYS ARE TO BE COVERED. ALL REMOVABLE BMP DEVICES SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN FIVE DAY RAIN PROBABILITY FORECAST EXCEEDS 40%.
4. A CONCRETE WASHOUT SHALL BE PROVIDED ON ALL PROJECTS WHICH PROPOSE THE CONSTRUCTION OF ANY CONCRETE IMPROVEMENTS THAT ARE TO BE POURED IN PLACE ON THE SITE.
5. THE CONTRACTOR SHALL RESTORE ALL EROSION/SEDIMENT CONTROL DEVICES TO WORKING ORDER AFTER EACH RUN-OFF PRODUCING RAINFALL OR AFTER ANY MATERIAL BREACH IN EFFECTIVENESS.
6. ALL SLOPES THAT ARE CREATED OR DISTURBED BY CONSTRUCTION ACTIVITY MUST BE PROTECTED AGAINST EROSION AND SEDIMENT TRANSPORT AT ALL TIMES.
7. THE STORAGE OF ALL CONSTRUCTION MATERIALS AND EQUIPMENT MUST BE PROTECTED AGAINST ANY POTENTIAL RELEASE OF POLLUTANTS INTO THE ENVIRONMENT.



LEGEND:

DESCRIPTION	SYMBOL
STABILIZED CONST. ENTRANCE (TC-1)	
GRAVELBAG CHECK DAM(SE-6)	
FIBER ROLLS (SE-5)	
SILT FENCE (SE-1)	
CONCRETE WASTE MANAGEMENT* (WM-6 & WM-8)	CONCRETE WASTE
CONCRETE WASHOUT FACILITIES* (WM-8)	CONCRETE WASH
WASTE MANAGEMENT FACILITIES* (WM 5 & 10)	WASTE MNGMT.
MATERIAL DELIVERY AND STORAGE* (WM-1)	MATERIAL STORAGE
STREET SWEEPING AND VACUUMING* (SC-7)	STREET SWEEPING
STOCKPILE MANAGEMENT* (WM-3)	STOCKPILE MNGMT.
VEHICLE STORAGE AND SERVICE AREA* (NS 8, 9 & 10)	VEHICLE STORAGE
EQUIPMENT STORAGE AND SERVICE AREA* (NS 8, 9 & 10)	EQUIPMENT STORAGE
SPILL PREVENTION AND CONTROL* (WM-4)	SPILL PREVENT
WATER CONSERVATION PRACTICES* (NS-1)	WATER CONSERVE

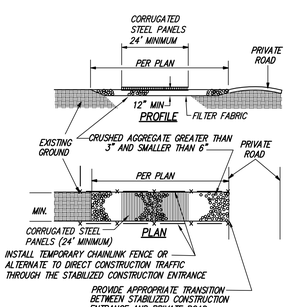
* CONTRACTOR TO DETERMINE LOCATION(S) IN FIELD. LOCATIONS MAY CHANGE THROUGHOUT THE DURATION OF CONSTRUCTION. CONTRACTOR SHALL UPDATE THE PROJECT SWPPP WITH ALL FIELD CHANGES

FLAT AREAS OF LESS THAN 5% (LIKE BUILDING PADS, PARKING AREAS, LEACH FIELDS) SHALL HAVE 100% PROTECTION USING GEOTEXTILES, MATS (EC-7), OR OTHER MATERIALS APPROVED BY THE CITY FOR STABILIZING SLOPES, OR USING TRACKING AND SOIL STABILIZERS/BINDERS (EC-5), TEMPORARY SEEDING (EC-4), MULCH/WOOD CHIPS (EC-3, EC-6, EC-8), OR JUTE MATTING (EC-7). AREAS OF GRADED PADS THAT HAVE ACTIVE STRUCTURE CONSTRUCTION UNDERWAY MAY BE PROTECTED BY ROLLED PLASTIC AS PART OF A WEATHER-TRIGGERED ACTION PLAN UNTIL THE STRUCTURE'S ROOF HAS BEEN COMPLETED. THE REMAINDER OF THE PAD AREA MUST CONTINUE TO BE PROTECTED USING EROSION CONTROL MEASURES IDENTIFIED ABOVE.

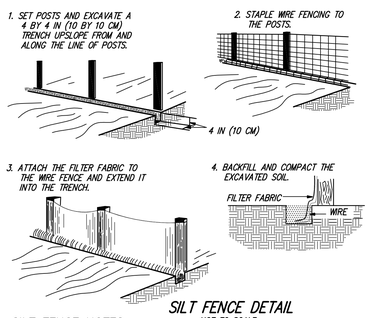
SCALE: 1" = 10'

0 5 10 20 30

GRAPHICAL SCALE



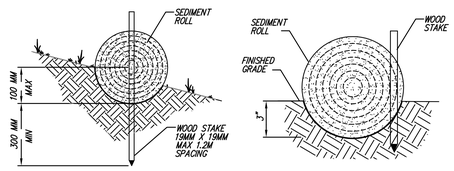
STABILIZED CONSTRUCTION ENTRANCE
NOT TO SCALE



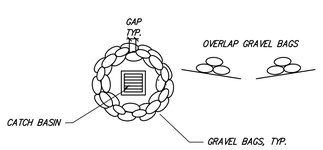
SILT FENCE DETAIL
NOT TO SCALE

SILT FENCE NOTES:

1. POSTS FOR SILT FENCES SHALL BE EITHER 4-INCH-DIAMETER WOOD OR EQUIVALENT WITH A MINIMUM LENGTH OF 5 FEET. POSTS SHALL BE SPACED A MAXIMUM OF 10 FEET APART AND DRIVEN SECURELY INTO THE GROUND (MINIMUM OF 12 INCHES). 2" DIA. WOOD OR EQUIVALENT MAY BE USED PROVIDED POST SPACING DOES NOT EXCEED 4'.
2. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 4 INCHES WIDE AND 4 INCHES DEEP ALONG THE LINE OF POSTS
3. THE FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE POST, AND 8 INCHES OF THE FABRIC SHALL EXTEND INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
4. THE TRENCH SHALL BE BACKFILLED AND THE SOIL COMPACTED OVER THE TOE OF THE FILTER FABRIC.
5. THE MAXIMUM DRAINAGE AREA BEHIND THE SILT FENCE SHALL BE 1.0 ACRE.
6. THE MAXIMUM SLOPE LENGTH BEHIND THE BARRIER SHALL BE 100 FEET.



FIBER ROLL
NOT TO SCALE



CATCH BASIN PROTECTION DETAIL
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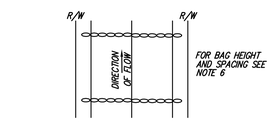
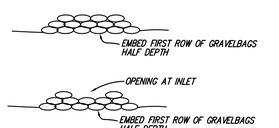
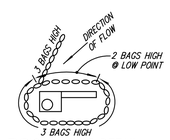


GRAVEL/GRAVEL BAGGING ON STREETS



BAG EMBEDDING DETAIL
NOT TO SCALE



TYPICAL INLET DETAIL

GRAVELBAG DETAILS (PVT)
NOT TO SCALE

BENCHMARK	
DESCRIPTION:	INTERSECTION OF SANTA FE STREET AND BALBOA AVENUE STREET CENTERLINE MONUMENT
RECORD FROM:	CITY OF SAN DIEGO BENCH MARK
ELEVATION:	47.451 DATUM M.S.L.

Alidade ENGINEERING
28441 RANCHO CALIFORNIA ROAD, SUITE 100
TEMECULA, CA 92590
PH: (951) 587-2020
FAX: (951) 587-2626

REGISTERED PROFESSIONAL ENGINEER BRENT C. MOORE No. 59121 Exp. 6-30-15 CIVIL STATE OF CALIFORNIA

BY: _____ BRENT C. MOORE DATE: _____

R.C.E. NO.: 59121 REGISTRATION EXPIRATION DATE: 6-30-2015

10-121WPCP-GP.dwg 7-10-13 11:07:08 am EST

GENERAL CONSTRUCTION ACTIVITY

WATER POLLUTION CONTROL PLAN

FOR

TEMPORARY FIRE STATION NO. 17

(CONSTRUCTION SITE PRIORITY LOW)

Project No. WBS S-00783

Prepared for:

City of San Diego
41ST Street and University Avenue
San Diego, CA 92105

Prepared by:

Alidade Engineering
28441 Rancho California Road, Suite 100
Temecula, CA 92590

July 7, 2014

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INTRODUCTION

This Water Pollution Control Plan (WPCP) has been prepared as part of the CIP Submittal requirements for the redevelopment of City owned property located at the northwest corner of 41st Street and University Avenue for the Temporary Fire Station No. 17 project. This WPCP provides recommendations and procedures to fulfill storm water discharge requirements specified by the current City of San Diego Storm Water Standards Manual. Site information, description and responsible parties are provided within.

Water Pollution Control Plan (WPCP)

This WPCP has been prepared in accordance with the City of San Diego's Storm Water Standards Manual adopted on January 14, 2011. This WPCP has been developed and amended or revised, when necessary, to meet the following objectives:

- Identify all pollutant sources including sources of sediment that may affect the quality of storm water discharges associated with construction activity (storm water discharges) from the construction site, and
- Identify non-storm water discharges, and
- Identify, construct, and implement in accordance with a time schedule, and maintain Best Management Practices (BMPs) to reduce or eliminate pollutants in storm water discharges from the construction site during construction to the Maximum Extent Practicable (MEP), and
- Develop a maintenance schedule for BMPs installed during construction designed to reduce or eliminate pollutants after construction is completed (post-construction BMPs).

This WPCP shall be implemented concurrently with commencement of soil-disturbing activities associated with new construction or immediately for ongoing construction. The requirements of the WPCP are intended to be implemented on a year-round basis. All conditions of the WPCP shall be complied with.

The WPCP shall be kept at the construction site during construction activity and shall be made available upon request to representatives of the City of San Diego.

If a change of ownership occurs, the new owner shall be provided a copy of this WPCP and shall alert the City of San Diego of the change of ownership. The new owner shall amend this existing WPCP if necessary or develop a new WPCP within 30 calendar days.

This WPCP, together with all monitoring information, reports and data records for this construction activity, shall remain on the construction site while the site is under construction

and during working hours, commencing with the initial construction activity and ending with termination of construction activity.

The discharger is required to retain records of all monitoring information, copies of all reports required by the WPCP, and records of all construction activities to be covered by the WPCP for a period of at least five years from the date generated. This period may be extended by request of the City of San Diego. With the exception of reporting noncompliance to the appropriate City personnel, dischargers are not required to submit the records, except upon specific request by the City of San Diego.

This WPCP shall be amended whenever there is a change in construction or operations, which may affect the discharge of pollutants to surface waters, ground waters or a municipal separate storm sewer system (MS4). The WPCP shall also be amended if the discharger violates any condition of this WPCP or has not achieved the general objective of reducing or eliminating pollutants in storm water discharges. If the City of San Diego determines that the discharger is in violation, the WPCP shall be amended and implemented in a timely manner, but in no case more than 14 calendar days after notification by the City of San Diego. All amendments shall be dated and directly attached to the WPCP.

The City of San Diego may require the discharger to amend the WPCP.

Construction Site Description:

This Water Pollution Control Plan (WPCP) has been prepared as part of the CIP Submittal requirements for the redevelopment of City owned property located at the northwest corner of 41st Street and University Avenue for the Temporary Fire Station No. 17 project. The Temporary Fire Station No. 17 project consists of removing and replacing the existing concrete driveway apron to the site from 41st Street, construction of a D.G. parking lot with asphalt pavement for the ADA parking stall, installation of a temporary modular building to house the personnel of Fire Station No. 17 as well as a temporary structure to house the fire engine for Fire Station No. 17 and associated landscaping and hardscape. The project lies just east of Interstate 15, south of Interstate 8 and north of University Avenue. The project site will be accessed off 41st Street.

Responsible Parties:

Owner:

City of San Diego
41st Street and University Avenue
San Diego, CA 92105

Contractor: T.B.D.

Site Contact Person:

T.B.D.

Prepared By:
Alidade Engineering 7/7/2014

SITE MANAGEMENT REQUIREMENTS

Due to the fact that construction is a dynamic operation where changes are expected, storm water BMPs for construction sites are usually temporary measures that require frequent maintenance and/or relocation, revision, and reinstallation to maintain their effectiveness, particularly as project grading progresses. The site contact person responsible for self inspections is yet to be determined.

There are four primary purposes of the self-inspections conducted by owners and contractors:

- To ensure that the owner/contractor takes full responsibility for managing storm water pollution caused by their activities.
- To ensure that storm water BMPs are properly documented and implemented and are functioning effectively.
- To identify maintenance (e.g. sediment removal) and repair needs.
- To ensure that the project proponents implement their Storm Water Management Plans.

A self inspection checklist noting date, time, conditions and inspection date must be kept on site and made available for review if requested by City Staff. The self-inspection must be performed by a qualified Contact Person according to the following schedule:

- Daily forecasting at all times.
- At 24-hour intervals during extended rainfall events.
- Daily evaluations as earth moving/grading are being conducted during the wet season.
- Weekly (every 7 days) in the dry season as earth moving/grading is processing.

Storm water pollution prevention site management requirements include:

- A qualified person who is trained and competent in the use of BMPs shall be on site daily, although not necessarily full time, to evaluate the conditions of the site with respect to storm water pollution prevention. This qualified contact person shall represent the contractor/owner on storm water issues.
- The qualified person shall implement the conditions of the Water Pollution Control Plan, contract documents and/or local ordinances with respect to erosion and sediment control and other waste management regulations.
- The qualified person is responsible for monitoring the weather and implementation of any emergency plans as needed. The weather shall be monitored on a 5-day forecast plan and a full BMP protection plan shall be activated when there is a 40% or greater chance of rain.
- The qualified person is responsible for overseeing any site grading and operations and evaluating the effectiveness of the BMPs. This person shall modify the BMPs as necessary to keep the dynamics of the site in compliance. This person or other qualified persons are responsible for checking the BMPs routinely for maintenance and documenting the BMPs being implemented.

PERFORMANCE STANDARDS

The City of San Diego will evaluate the adequacy of the owner's/contractor's site management for storm water pollution prevention, inclusive of BMP implementation, on construction sites based on performance standards for storm water BMPs. Poor BMP practices shall be challenged.

Performance standards shall include:

- No measurable increase of pollution (including sediment) in run-off from site.
- Prevention of slope erosion.
- Mitigation of runoff discharge velocity less than or equal to pre-construction levels.
- Preservation of natural hydraulic features and riparian buffers where possible.

A site will be considered inactive if construction activities have ceased for a period of 7 or more consecutive calendar days. At any time of the year, an inactive site must be fully protected from erosion and discharges of sediment. It is also the owner's/contractor's responsibility at both active and inactive sites to implement a plan to address all potential non-storm water discharges.

Regardless of inspections conducted by the City, property owners or contractors are required to prevent any construction-related materials, wastes, spills or residues from entering a storm water conveyance system.

SEASONAL REQUIREMENTS

A. Year round requirements include but are not limited to:

- Perimeter protection BMPs must be installed and maintained to comply with performance standards (above).
- Sediment control BMPs must be installed and maintained to comply with performance standards (above).
- BMPs to control sediment tracking must be installed and maintained at entrances/exits to comply with performance standards (above).
- Materials needed to install standby BMPs necessary to completely protect the exposed portions of the site from erosion and to prevent sediment discharges must be stored on site. Areas that have already been protected from erosion through implementation of physical stabilization or established vegetation stabilization BMPs (as described below) are not considered to be "exposed" for purpose of this requirement.
- The owner/contractor must have an approved "weather triggered" action plan and have the ability to deploy standby BMPs as needed to completely protect the exposed portions of the site within 24 hours of prediction of a storm event (a predicted storm event is defined as a forecasted 40% or greater chance of rain). On request, the owner/contractor must provide proof of this capability that is acceptable to the City of San Diego. The owner/contractor shall also show the area that will be cleared, graded and left exposed at any given time will be limited to the area that the owner/contractor can adequately protect prior to a predicted rainstorm.
- Deployment of physical or vegetation erosion control BMPs must commence as soon as grading and/or excavation is completed for any portion of the site. The project proponent may not continue to rely on the ability to deploy standby BMP materials to prevent erosion of graded areas that have been completed.
- Protect and stabilize all slopes during rain events.
- A washout area shall be designated and maintained for materials such as concrete, stucco, paint, caulking, sealants, drywall plaster, etc.
- Properly protected designated storage areas are required for materials and wastes.
- Trash and debris shall be removed and properly stored or disposed of daily.
- Storage, service, cleaning and maintenance areas for vehicles and equipment shall be identified and protected accordingly.
- Materials for spill control/containment must be stockpiled onsite.
- Non-storm water discharges must be eliminated or controlled to the maximum extent practicable.

B. Additional Requirements for the Rainy Season (October 1 through April 30) include but are not limited to:

- Erosion control BMPs must be upgraded, if necessary, to provide sufficient protection for storms likely to occur during the rainy season.
- Perimeter protection and sediment control BMPs must be upgraded, if necessary, to provide sufficient protection for storms likely to occur during the rainy season.
- Adequate physical or vegetation erosion control BMPs must be installed and established for all graded areas prior to the start of the rainy season. These BMPs must be

maintained throughout the rainy season. If a selected BMP fails, it must be repaired and improved, or replaced with an acceptable alternate as soon as it is safe to do so. The failure of a BMP shows that the BMP, as installed, was not adequate and the design should be corrected or modified as necessary. Repairs or replacements must therefore implement a more effective BMP.

- All vegetation erosion control must be established prior to the rainy season to be considered as a BMP.
- A disturbed area that is not completed but that is not being actively graded must be fully protected from erosion if left idle for 7 or more calendar days. The ability to deploy standby BMP materials is not sufficient for these areas. BMPs must actually be deployed.

BEST MANAGEMENT PRACTICES

Construction material loading, unloading, and access areas:

Construction materials shall be loaded and unloaded, as needed, at the construction site in areas that have minimal storm water run-on. Any spillage, which occurs during transfer, shall be cleaned up immediately. Each contractor and subcontractor shall bring to the job site only the material to be used that day. Large material items shall be placed adjacent to their installation points so as to minimize handling.

Equipment/vehicle storage, cleaning and maintenance areas:

Equipment storage, cleaning, and maintenance areas shall be designated for the duration of construction. No equipment, other than that used for the grading operations, shall be stored onsite. Each contractor and subcontractor shall be provided with a yard for material and equipment storage as designated. Silt fencing/fiber rolls shall be provided on the downstream side of the storage areas to prevent transport of contaminates due to spills or leakage. Diversion of run-on away from storage areas to minimize potential contamination shall be implemented.

All debris and waste from the contractor's cleaning and maintenance operations shall be properly disposed of via the following good housekeeping practices which shall be inspected regularly using the checklist included in this WPCP:

- cover and store materials, where practical,
- minimize contact with rainfall or runoff,
- minimize waste, and
- dispose of waste properly and recycle, where possible

Routine and emergency vehicle maintenance is expected to occur on-site when necessary. Vehicle storage, cleaning, and maintenance operations shall be limited to a designated area.

Methods of on-site storage and disposal of construction materials:

As mentioned above, each contractor and subcontractor shall be provided with a yard for material and equipment storage. If over 55 gallons is stored onsite, all paints and solvents are required to be stored inside a roofed and lockable storage container. The contractor or subcontractor shall store only enough product required and are responsible for following the manufacturer's directions for the proper use and disposal of used and unused products. All waste material generated shall be properly disposed of at an approved disposal site. Trash shall be separated by type of handling required, as described within this WPCP.

Construction materials to be disposed of shall be placed in dumpsters, other receptacles, or designated storage area appropriate for the waste material at the end of each working day.

The contractor and subcontractor shall take all necessary and proper precautions to protect adjacent property owners from any or all damage that may occur from storm water runoff and/or deposition of debris resulting from any and all work in conjunction with construction.

POTENTIAL POLLUTANT SOURCES

The primary potential source of pollution to storm water is sediment.

Potential pollutants other than sediment associated with construction activity include soil amendments, solvents, metals, petroleum products, plated products, asphalt/concrete, hazardous substances, treated wood products, and other products typically associated with construction sites. These materials can be classified into hazardous, solid, and liquid wastes. Hazardous wastes include solvents, metals, petrochemicals (oils, gasoline, asphalt degreaser, etc.) pesticides, (insecticides, fungicides, herbicides, rodenticides, etc.), and other construction chemicals such as concrete products, sealer, and wash water associated with these products. Other wastes include paper, wood, garbage, sanitary wastes, and fertilizer.

Pollutants such as oils, waxes, and water-insoluble pesticides, form surface films on water and solid particles. Also, oil films serve as a medium for concentrating water-soluble insecticides. Other than by use of very costly water-treatment facilities or long runoff water detention periods, these pollutants become nearly impossible to control once present in the runoff.

Non-stormwater discharges associated with the construction activities for this project may include street washing and dewatering. Although these flows may occur on-site, efforts shall be made to control these flows to the maximum extent practicable.

The contractor shall be responsible to implement a concrete wash out area, as shown on the Site Map attached at the end of this report, and pursuant to the plan notes located on said plan. It is anticipated that the location of the control practices shall change over the lifetime of the project; therefore, the contractor will note and date the changes on the appropriate maps within this WPCP, as applicable.

Pre-construction control practices (if any) to reduce sediment and other pollutants in storm water discharge:

Entry to and exit from the construction area shall be via either Chamoune Ave or the un-named alley adjacent to the westerly property line. If space allows, all access ways to pervious areas shall be via a stabilized construction entrance consisting of crushed aggregate greater than 3"and smaller than 6" (or equivalent) at a thickness of 12" minimum or as recommended by the soils engineer. The access way shall include a minimum of 24' of corrugated steel panels installed over the crushed aggregate. The stabilized construction entrance shall extend a minimum of 50 feet into the site and a temporary chain-link fence or alternate channelization device shall be installed to direct construction traffic through the stabilized construction entrance. Street surfaces adjacent to construction site exits shall be swept of visible dust and sand and the sediment removed from the street.

The City of San Diego is the local agency responsible for the administration of grading and erosion control plans through their land development permit process. The basic requirements and recommendations of the local land development ordinance are considered a part of the provisions of this WPCP.

Practices to control construction-related pollutants:

The following information summarizes the nature and control of various construction-related pollutants other than sediment.

(i) Solvents

Construction activity often uses solvents for de-greasing, cleaning machinery and machinery parts. For roofing activity, residual tars and sealing compounds, spent solvents, kerosene, and soap cleaners may be produced. For sheet metal activity, small quantities of acid and solvent cleaners such as kerosene, metal shavings, adhesive residues, and enamel coatings may be produced. Solvents which become waste material are classified as dangerous waste.

Recommended Control Best Management Practices (BMPs): Solvents and solvent associated wastes shall be stored in containers. The following practices apply to containers which are stored outside in a temporary storage area:

- Dumpsters used to store items avoiding transfer to a landfill shall be placed in a lean-to structure. Dumpsters shall be in good condition, without corrosion or leaking seams.
- If waste container drums are kept outside, they must be stored off the ground in a lean-to type structure or under plastic cover to prevent rainfall contact with the drums.
- Garbage dumpsters shall be replaced if they are deteriorating to the point where leakage is occurring and shall be covered to prevent storm water from entering.
- Use non-caustic detergents for parts cleaning.

- Use detergent-based or water-based cleaning systems in place of organic solvent degreasers.
- Replace chlorinated organic solvents (1, 1, 1 -trichloroethane, methylene chloride, etc.) with non-chlorinated solvents. Non-chlorinated solvents, such as kerosene or mineral spirits, are less toxic and less expensive to dispose of. Check the list of active ingredients to see whether it contains chlorinated solvents. (The "chlor" term indicated that the solvent is chlorinated.)
- Choose cleaning agents that can be recycled.

(ii) Metals

Various types of metals are used on a construction site.

Recommended Control BMPs: Where metals are temporarily stored outside, plastic sheeting shall be placed over the stockpile. This material shall be stored, where possible, on a paved surface. Curbing shall be placed along the perimeter of the area to prevent the run-on of uncontaminated storm water from adjacent areas, as well as runoff from the stockpile area.

(iii) Petroleum Products

Petroleum products are widely used during construction activities. These products are used as fuels and lubricants for vehicular operations, power tools, and general equipment maintenance. The pollutants include oils; fuels such as gasoline, diesel oil and kerosene; lubricating oils; and grease. Asphalt paving can be a pollutant source as it continues to release various oils for a considerable length of time. Most of these pollutants adhere to soil particles and other surfaces easily.

Recommended Control BMPs: One of the best practices of control is to dispose of sediments containing oil from the construction site into an authorized disposal facility.

Oil and oily wastes such as crankcase oil, cans, rags, and paper dropped in oils and lubricants shall be best disposed of in proper receptacles or recycled. Waste oil for recycling shall not be mixed with degreasers, solvents, antifreeze or brake fluid. The dumping of these wastes in sewers and other drainage channels is illegal and could result in fines or job shutdown. A further source of these pollutants is leaking vehicles. Proper maintenance of equipment and use of drip pans shall further reduce pollution by leaking vehicles.

Guidelines for storing petroleum products:

- Keep tanks off the ground and on wooden pallets.
- Store products off the ground under weather-resistant coverings, where possible.
- If storing more than 55 gallons, create shelter around area with cover and wind protection, and create impervious berm around the perimeter. Capacity of bermed area shall be 110 percent of largest container.
- All products shall be clearly labeled.

- Keep lids securely fastened.
- Post information for procedures in case of spills. Persons trained in handling spills shall be onsite or on-call at all times. Materials for cleaning up spills shall be kept onsite and easily available. Spills shall be cleaned up immediately and the contaminated material properly disposed of.

(iv) Plated Products

Plated products used on a construction site include galvanized material and other metal plated products.

Recommended Control BMPs: Where plated products are temporarily stored outside, plastic sheeting such as polyethylene, polyurethane, polypropylene or hypalon shall be used. Curbing shall be placed along the perimeter of the area to prevent the run-on of uncontaminated storm water from adjacent areas, as well as runoff from the stockpile area.

(v) Asphalt/Concrete

1 Asphalt

Asphalt paving requires dump trucks, pavers, tack coat tankers, and pavement rollers. Storm water passing through near this equipment may be contaminated by petroleum products.

Storm water from parking area may contain undesirable concentrations of oil and grease, suspended particulates, and metals such as lead, cadmium, and zinc. It shall also contain the organic by-products of engine combustion.

Recommended Control BMPS: Source control BMPs such as good housekeeping shall always be used to control storm water pollution.

2 Concrete

On construction sites, concrete may be pumped or transferred from trucks into the required area (i.e., new pedestrian access ramp / stairwell). Concrete wash-water from concrete trucks and mixers is a pollutant. Cement (in bags) may be stored onsite for small jobs.

Recommended Control BMPS: The control of this pollutant involves good site planning. Neutralization of this pollutant often provides the best treatment. Sealing of fractures in the bedrock with grout and bentonite shall reduce the amount of concrete wash seepage.

- Transfer of concrete/cement from vehicles to site shall be located so leaks can be confined in the existing containment.
- Place plastic sheeting over stored concrete material.

- Store material, where possible, on a paved area sloped in a manner that minimizes the pooling of water.
- Curbing shall be placed along the perimeter of the area to prevent run-on of uncontaminated storm water from adjacent areas as well as runoff from the stockpile area.

(vi) Hazardous Substances

The most economical and effective controls for potential pollutants other than sediment generated on the construction site, are the exercise of good housekeeping practices and an awareness of the need for compliance with regulatory requirements. The following general procedures are recommended based on the substance:

- Containers shall be located in a covered designated area.
- The designated area shall be paved, free of cracks and gaps, and impervious in order to contain leaks and spills.
- The area inside the curb shall slope to a drain. If the material being stored is controlled by the Uniform Fire Code, or is used oil or dangerous waste, a dead-end sump shall be installed.
- If roll-containers are used (i.e., dumpsters) and are picked up directly by the collection truck, a filet shall be placed on both sides of the curb to facilitate moving the dumpster.
- Construction activity accumulating dangerous wastes that do not contain free liquids shall be protected from storm water run-on.
- Where material is temporarily stored in drums, a containment system shall be used.
- Drums stored in an area where unauthorized persons may gain access must be secured in a manner that prevents accidental spillage, pilferage or any unauthorized use.
- An employee trained in emergency spill cleanup procedures shall be present when dangerous wastes, liquid chemicals or other wastes are loaded or unloaded.

(vii) Paints

Painting contractors shall generate paint and other finishing residues, spent thinners, and paint containers. Paint is a chemical pollutant containing hazardous metallic pigments or biocides, and is carried by sediment and runoff from construction sites.

Recommended Control BMPs: As in the case of other pollutants, good housekeeping is the most important means of controlling pollution. The correct method of waste disposal varies with the material. Wash-up wastes from water-based paints may go into a sanitary sewer, but wastes from oil-based paints, cleaning solvents, thinners, and mineral spirits must be disposed of through a licensed waste management firm. Other source-control BMPs include:

- Use tarps and vacuums to collect solid wastes produced by sanding or painting.

Tarps, drip pans, or other spill collection devices shall be used to collect spills of paints, solvents or other liquid materials. These wastes shall be disposed of properly to keep them from contaminating storm water.

- As little as 30 percent of the paint may reach the target from conventional airless spray guns; the rest is lost as overspray. Paint solids from overspray are deposited on the ground where they can contaminate storm water. Other spray equipment that delivers more paint to the target and less overspray shall be used: electrostatic spray equipment, air-atomized spray guns, high-volume/low-pressure spray guns, and gravity-feed guns.

(viii) Treated Wood Products

This group includes wood products such as cut wood and treated wood, and, where cutting equipment is employed, chips and sawdust. The timber is typically moved by hand after being deposited by truck. Other wastes include wood and paper from packaging and building materials.

Recommended Control BMPs: The major control mechanism for these pollutants is to remove collected wood waste and haul to an authorized disposal facilities. Outside areas where treated wood products are stored shall be located where storm runoff through the area is minimal.

- Where possible, store material on a paved area that is sloped so that pooling of water at the site is minimized.
- Remove and properly dispose of soils with visible surface contamination (green soil) to decrease the spread of chemicals to ground water and surface water and take steps to prevent future occurrences.
- Keep treated wood out of areas where surface water drainage is apparent. Curbing shall be placed along the perimeter of the area to prevent run-on of uncontaminated storm water from adjacent areas, as well as runoff from the stockpile area.

(ix) Training

The goal of the storm water pollution prevention training program is to inform employees, contractors, and subcontractors of their levels of responsibility for components and goals of the WPCP. This training program is a preventative maintenance technique, because when properly informed, employees, contractors, and subcontractors have increased awareness and are more capable of preventing spills, responding safely and effectively to accidents, and recognizing situations that could lead to storm water contamination.

Storm water pollution prevention training shall be provided regularly by the Contractor. One training session shall be presented just prior to the start of the wet season. Topics can include, but are not limited to: spill prevention and response, inspection records, annual reporting, locations and functions of sediment control devices, good housekeeping, and material

management practices. Attendance records shall be kept for each training session. Inspection logs and checklists shall be distributed to all personnel who shall be performing the monitoring and reporting. Appendix B presents the Training Log and is provided so that all training sessions can be documented. This log shall be revised/amended by the contractor/owner when appropriate

This WPCP has been prepared by:

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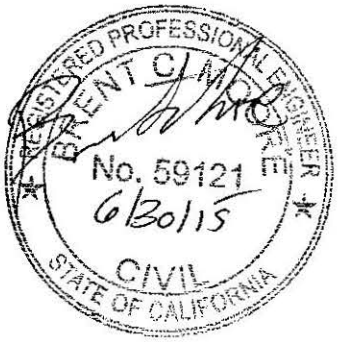


Brent C. Moore, P.E. Date
Principal

APPENDIX A
Amendments of WPCP

DATE:	BY:	DESCRIPTION:

APPENDIX B
Training Log

Name of Person Attending Training Workshop	Date of Training Workshop	Title of Training Workshop	Location of Training Workshop

APPENDIX C
INSPECTION CHECKLIST FOR
WPCP PRE, POST AND DURING STORM EVENT INSPECTION REPORT
ORIGINAL – MAKE COPIES

Date of Inspection: _____ **Inspector's Name:**_____
Inspector's Title:_____
Time of Inspection:_____

Attach an 8 ½" x 11" Copy of Plans with Notes for each Location Listed below

Signed By:_____

Weather Information:

- Best estimate of beginning of storm:_____
- Duration of event:_____
- Amount of rainfall (inches):_____

Location and Description	**Repair Required? Action**
Location and Description	**Repair Required? Action**
Location and Description	**Repair Required? Action**
Location and Description	**Repair Required? Action**

Prepared By
Alidade Engineering 7/7/2014

APPENDIX C
Inspection Guidelines

PROTECTION DEVICES	INSPECT FOR:	MAINTENANCE MEASURES
Vegetation	• Rills or gullies forming	• Inspect for adequate stand of vegetation, re-seed
	• Bare soil patches	• Re-seed bare areas
	• Sediment at toe of slope	• Identify sediment source, control at source
Dikes	• Gully on slope below dike breach; low spot in dike	• Fill gully or low spot, re-compact
	• Loose soil	• Remove and re-compact
	• Erosion of dike face	• Install adequate protection
Swales	• Gully on slope below swale	• Fill gully; restore positive drainage
	• Water ponded in swale	• Properly grade to provide positive drainage and prevent ponding
	• Sediment or debris in channel	• Identify source of sediment or debris; install control measures at source. Remove sediment
	• Erosion of un-lined channel surface	• Install erosion protection
	• Erosion of channel lining	• Check construction. Install adequate protection.
Pipe slope drain or chute	• Blocked inlet or outlet	• Remove blockage
	• Runoff bypassing inlet	• Check construction. Check for clogging and check grade for positive drainage into inlet.
	• Erosion at outlet	• Check construction. Install adequate protection.

Grassed waterways	• Bare areas • Tall growth	• Re-vegetate bare areas • Restore channel conditions per plan
Riprap-listed waterway	• Scour under riprap	• Check construction. Install adequate protection.
Silt fence	• Undercutting of fence • Fence collapsing • Torn fabric • Runoff draining around barrier • Sediment level near top of fence	• Fill undercut and re-compact • Replace section • Replace torn fabric • Extend fence and/or re-grade to prevent • Remove sediment, dispose of properly
Check dam	• Sediment accumulation • Flow escaping around sides of check dam • Displacement of sandbag, stones or straw bales	• Remove sediment, dispose of properly • Check construction, repair/restore as necessary • Reconstruct per plan
Inlet protection	• Flooding around or below inlet • Undercutting of bales or silt fence, bale displacement, torn fabric, etc.	• Check grading/construction. Check for clogging and restore for positive drainage into inlet • Fill undercut and recompact
Outlet protection	• Dislodged stone • Erosion blew outlet • Outlet scour	• Restore erosion protection per plan • Check construction. Repair accordingly • Check construction. Repair accordingly
Sediment traps and basins	• Sediment level near outlet elevation	• Remove sediment, dispose of properly

	• Obstructed outlet • Basin not dewatered between storms • Damaged embankments • Spillway erosion • Outlet erosion • Riser flotation • Excessive discharge to and from basin or trap • Sediment storage zone fills too quickly	• Remove obstruction • Check construction, clean openings in outlet • Repair damaged embankments • Check construction. Repair accordingly • Check construction. Repair accordingly • Check anchor block construction. Restore accordingly. Check riser couplings. • Check construction. Restore accordingly • Check construction. Restore accordingly

APPENDIX D

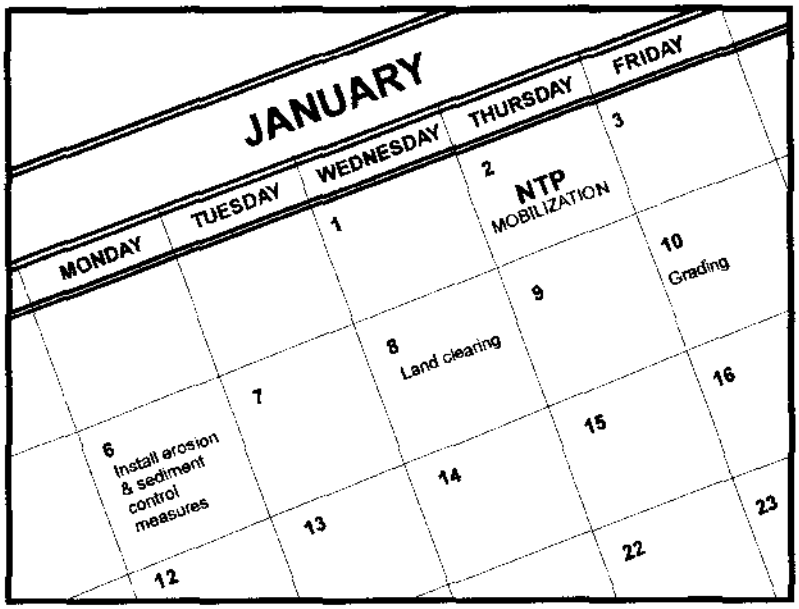
LIST OF CONTRACTORS/SUBCONTRACTORS

Name and Address Contractor/Subcontractor	Type of Work

APPENDIX E
BMPs From Caltrans Storm Water Quality Handbook
"Construction Site Best Management Practices Manual"
Dated November, 2009.

Scheduling (EC-1)
Silt Fence (SE-1)
Fiber Rolls (SE-5)
Gravel Bag Berm (SE-6)
Street Sweeping and Vacuuming (SE-7)
Storm Drain Inlet Protection (SE-10)
Stabilized Construction Entrance/Exit (TC-1)
Wind Erosion Control (WE-1)
Water Conservation Practices (NS-1)
Paving and Grinding Operations (NS-3)
Illicit Connection/Illegal Discharge Detection and Reporting (NS-6)
Potable Water/Irrigation (NS-7)
Vehicle and Equipment Cleaning (NS-8)
Vehicle and Equipment Fueling (NS-9)
Vehicle and Equipment Maintenance (NS-10)
Concrete Curing (NS-12)
Concrete Finishing (NS-13)
Material Delivery and Storage (WM-1)
Material Use (WM-2)
Stockpile Management (WM-3)
Spill Prevention and Control (WM-4)
Solid Waste Management (WM-5)
Hazardous Waste Management (WM-6)
Contaminated Soil Management (WM-7)
Concrete Waste Management (WM-8)
Sanitary/Septic Waste Management (WM-9)
Liquid Waste Management (WM-10)

Scheduling EC-1



Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates

to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

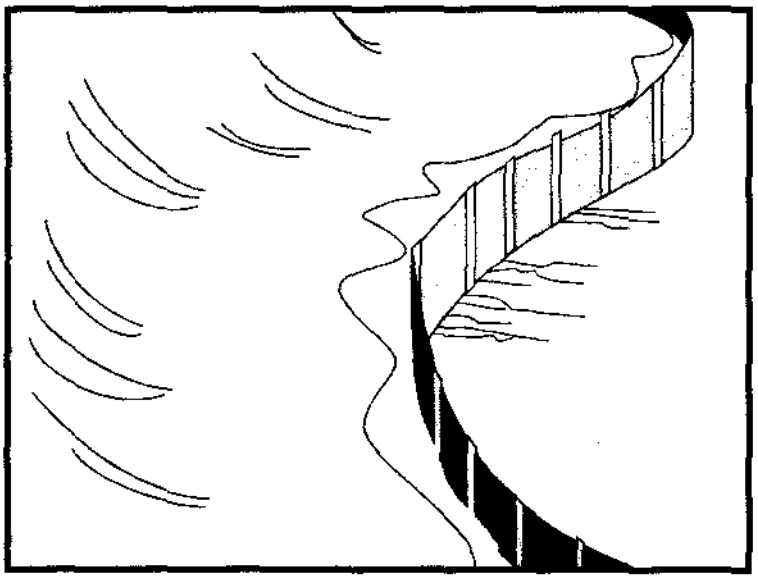
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Silt Fence SE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains water, promoting sedimentation of coarse sediment behind the fence. Silt fence does not retain soil fine particles like clays or silts.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences should not be used in locations where the flow is concentrated. Silt fences should always be used in combination with erosion controls. Suitable applications include:

- At perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

Targeted Constituents

Sediment (coarse sediment)	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm SE-12 Manufactured Linear Sediment Controls

SE-13 Compost Socks and Berms

SE-14 Biofilter Bags

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard.
- Do not use silt fence to divert water flows or place across any contour line.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Must be trenched and keyed in.
- Not intended for use as a substitute for Fiber Rolls (SE-5), when fiber rolls are being used as a slope interruption device.
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap coarse sediment by intercepting and detaining sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Silt fence should be used in combination with erosion controls up-slope in order to provide the most effective sediment control.
- Silt fence alone is not effective at reducing turbidity. (Barrett and Malina, 2004)
- Designers should consider diverting sediment laden water to a temporary sediment basin or trap. (EPA, 2012)
- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Efficiency of silt fences is primarily dependent on the detention time of the runoff behind the control. (Barrett and Malina, 2004)
- The drainage area above any fence should not exceed a quarter of an acre. (Rule of Thumb-100-feet of silt fence per 10,000 square feet of disturbed area.) (EPA 2012)

- The maximum length of slope draining to any point along the silt fence should be 100 ft per foot of silt fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area draining to the silt fence is permanently stabilized, after which, the silt fence fabric and posts should be removed and properly disposed.
- J-Hooks, which have ends turning up the slope to break up long runs of fence and provide multiple storage areas that work like mini-retention areas, may be used to increase the effectiveness of silt fence.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

In areas where high winds are anticipated the fence should be supported by a plastic or wire mesh. The geotextile fabric of the silt fence should contain ultraviolet inhibitors and stabilizers to provide longevity equivalent to the project life or replacement schedule.

- Layout in accordance with the attached figures.
- For slopes that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to protect silt fence from rocks (e.g., rockfall netting) ensure the integrity of the silt fence installation.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
- Use is generally limited to areas affected by high winds.
- Area draining to fence produces moderate sediment loads.

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. The fabric should conform to the requirements in ASTM designation D6461.
- Wooden stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the

thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts instead of wood stakes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).
- Bottom of the silt fence should be keyed-in a minimum of 12 in.
- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.
- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.
- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.
- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.
- The trench should be backfilled with native material and compacted.
- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of 1/3 and a maximum of ½ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the geotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
    - Ease of installation (most often done with a 2 person crew).
    - Minimal soil disturbance.
    - Better level of compaction along fence, less susceptible to undercutting
    - Uniform installation.
- Limitations:
    - Does not work in shallow or rocky soils.
    - Complete removal of geotextile material after use is difficult.
    - Be cautious when digging near potential underground utilities.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches 1/3 of the barrier height.
- Silt fences should be left in place until the upgradient area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.

- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Monitoring Data on Effectiveness of Sediment Control Techniques, Proceedings of World Water and Environmental Resources Congress, Barrett M. and Malina J. 2004.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), USEPA, 1990.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991.

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Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

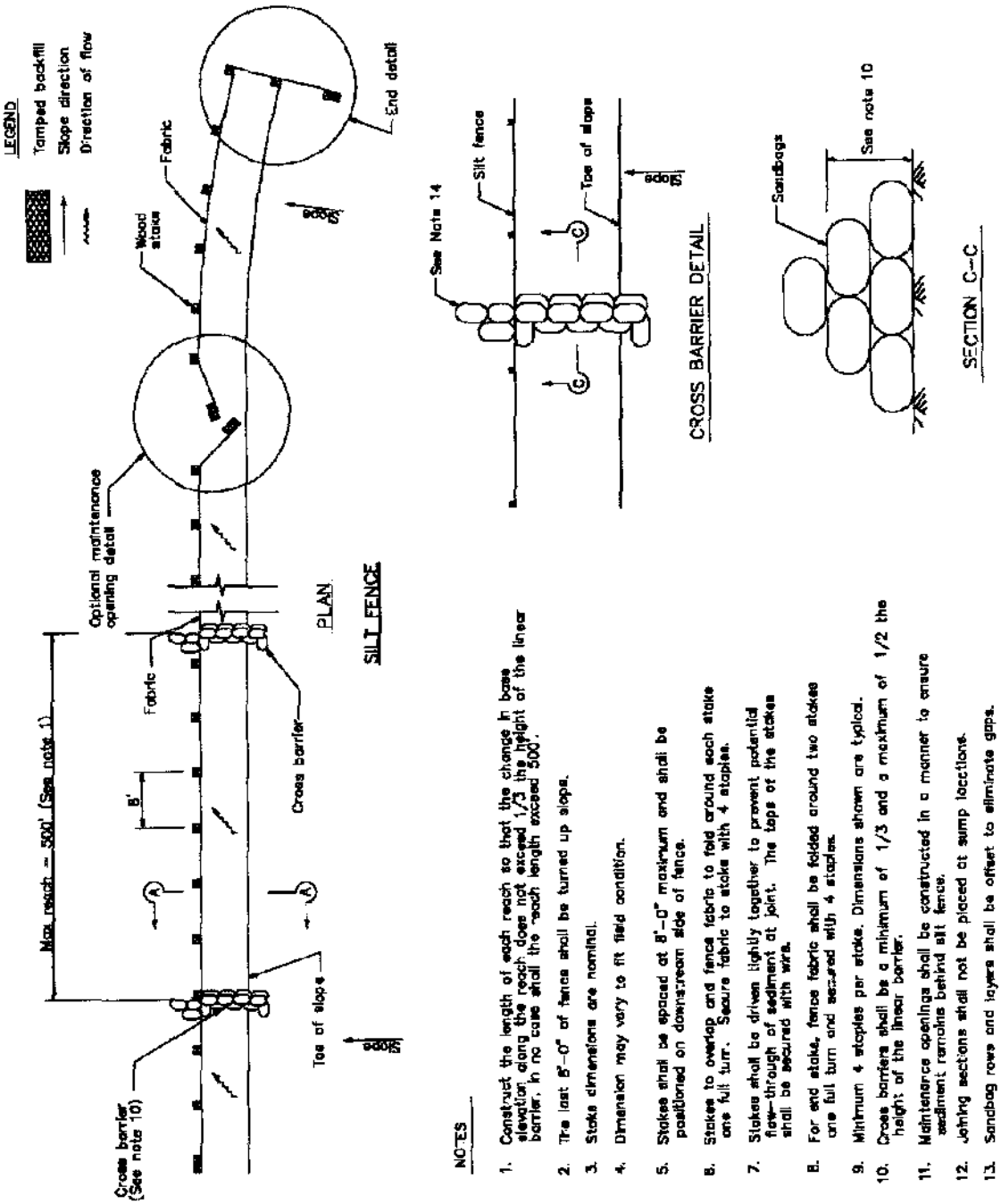
U.S. Environmental Protection Agency (USEPA). Stormwater Best Management Practices: Silt Fences. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 2012.

U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

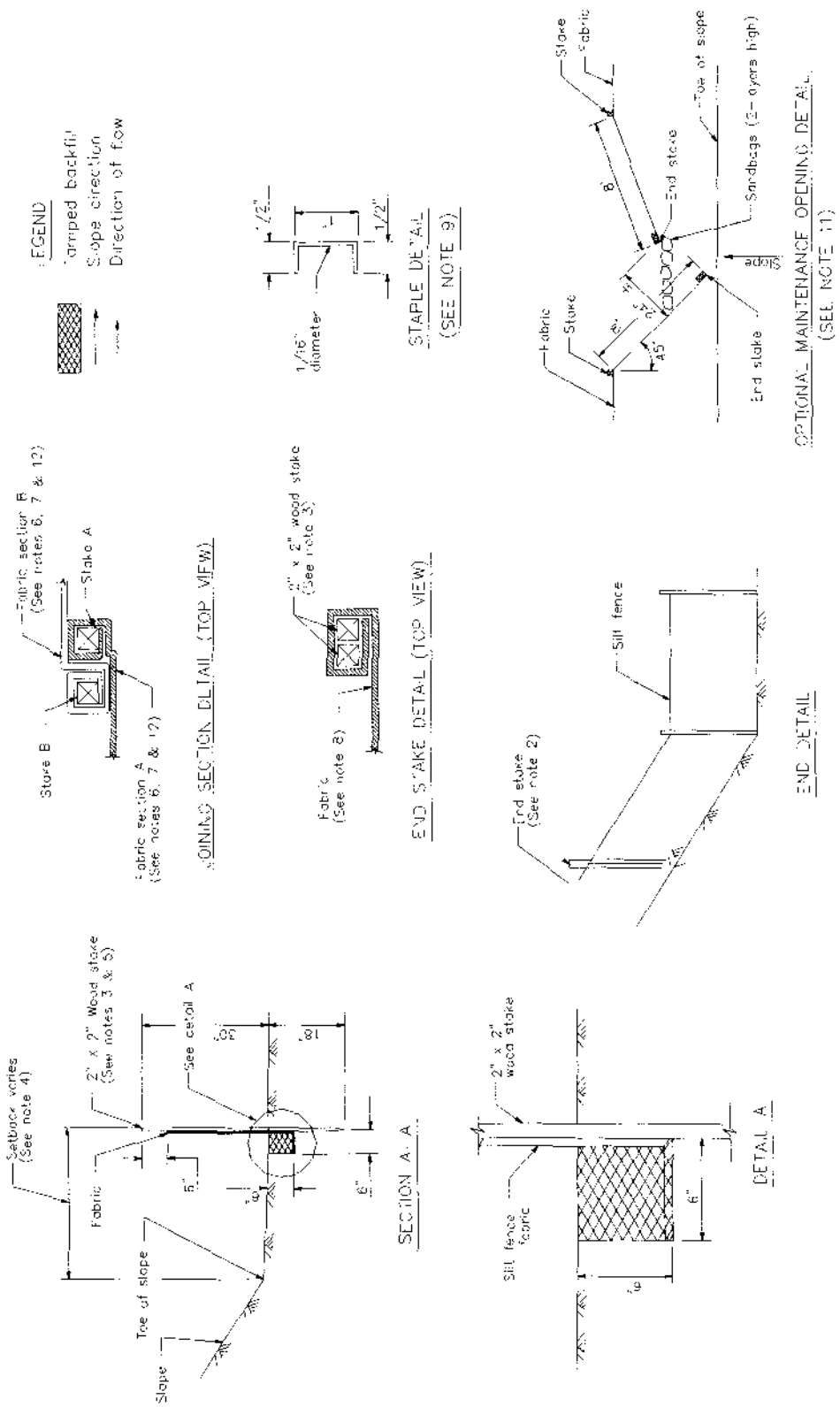
Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

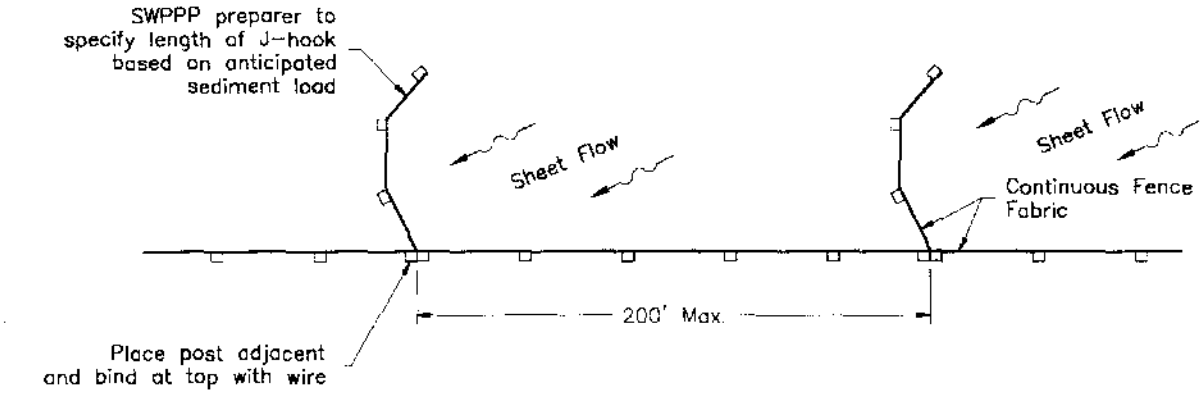
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'-0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'-0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3-4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.

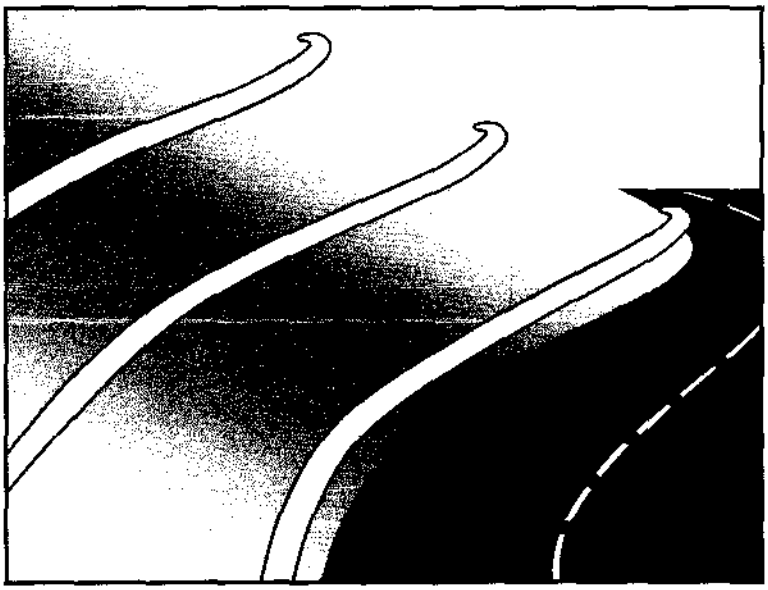

LEGEND
Barrier
Slope direction
Direction of flow
Fabric section B
(See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A
(See notes 6, 7 & 12)
JOINING SECTION DETAIL (TOP VIEW)
2" x 2" wood stake
(See note 3)
Fabric
(See note 8)
END STAKE DETAIL (TOP VIEW)
1/2"
1/16" diameter
STAPLE DETAIL
(SEE NOTE 9)
Stake
Fabric
Toe of slope
End stake
Sandbags (2- layers high)
Slope
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Silt fence
End stake
(See note 2)
END DETAIL
Setback varies
(See note 4)
2" x 2" Wood stake
(See notes 3 & 5)
Fabric
See detail A
Toe of slope
Slope
SECTION A-A
2" x 2"
wood stake
Silt fence
fabric
DETAIL A


SWPPP preparer to specify length of J-hook based on anticipated sediment load
Sheet Flow
Sheet Flow
Continuous Fence Fabric
200' Max.
Place post adjacent and bind at top with wire

Plan

J-HOOK

Fiber Rolls SE-5



Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-12 Manufactured Linear Sediment Controls

SE-14 Biofilter Bags

- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

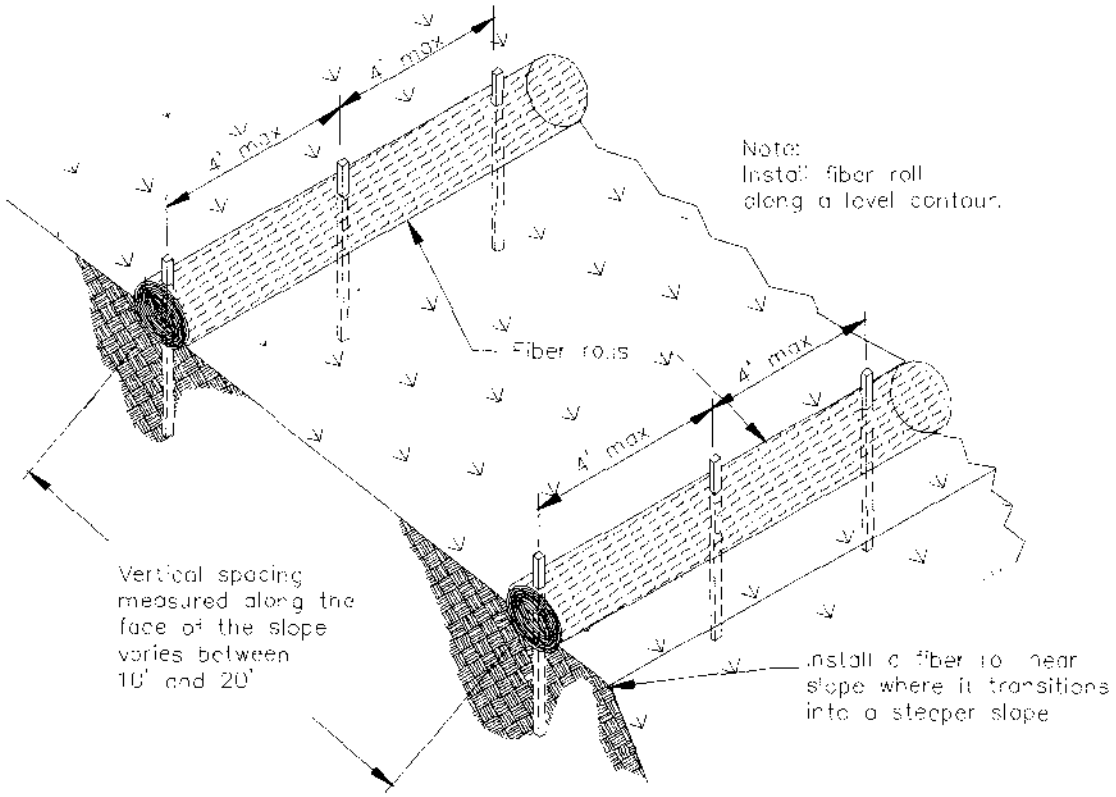
in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

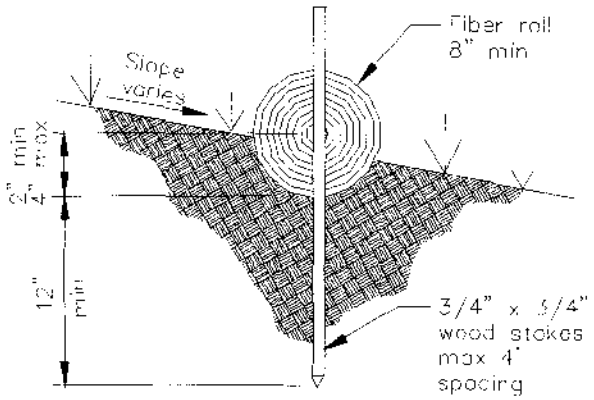
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

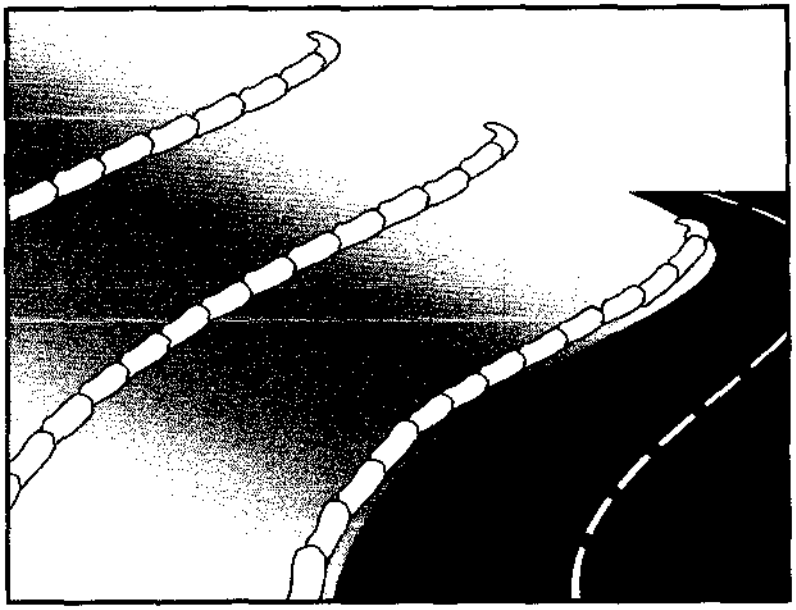


TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Gravel Bag Berm SE-6



Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-12 Temporary Silt Dike

SE-14 Biofilter Bags

- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** Fill material should be 0.5 to 1 in. crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs

Material costs for gravel bags are average and are dependent upon material availability. $2.50-3.00 per filled gravel bag is standard based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace gravel bags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

References

Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Street Sweeping and Vacuuming SE-7

Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

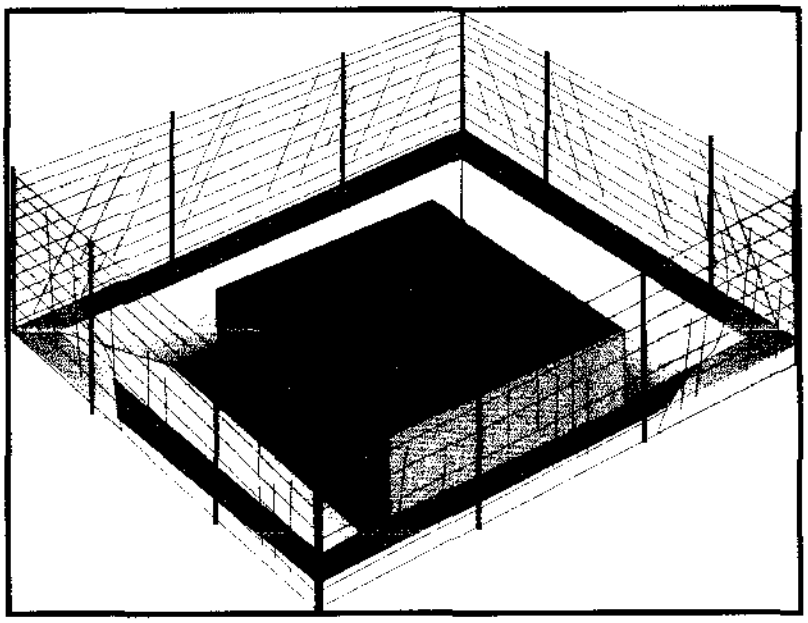
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Storm Drain Inlet Protection SE-10



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

SE-13 Compost Socks and Berms

Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area in, around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction. Temporary geotextile storm drain inserts attach underneath storm drain grates to capture and filter storm water.

Suitable Applications

- Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use

other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.
- Seven types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.

- Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
- Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
- Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
- Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
- Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
- Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
- Compost Socks: Allow filtered run-off to pass through the compost while retaining sediment and potentially other pollutants (SE-13). Appropriate for flows under 1.0 cfs.

- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Silt Fence*** - Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.

  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

5. Backfill the trench with gravel or compacted earth all the way around.

- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap*** - Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

- ***DI Protection Type 3 - Gravel bag*** - Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

  1. Construct on gently sloping street.
  2. Leave room upstream of barrier for water to pond and sediment to settle.
  3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.
  4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter*** - Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.
  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

- ***DI Protection Type 5 – Temporary Geotextile Insert (proprietary)*** – Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

- ***DI Protection Type 6 - Biofilter bags*** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.

    1. Construct in a gently sloping area.
    2. Biofilter bags should be placed around inlets to intercept runoff flows.
    3. All bag joints should overlap by 6 in.
    4. Leave room upstream for water to pond and for sediment to settle out.
    5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

- ***DI Protection Type 7 – Compost Socks*** – A compost sock can be assembled on site by filling a mesh sock (e.g., with a pneumatic blower). Compost socks do not require special trenching compared to other sediment control methods (e.g., silt fence). Compost socks should conform to specification detailed in SE-13, Compost Socks and Berms.

Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one year useful life) is $200 per inlet.
- Temporary geotextile inserts are proprietary and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from $50-75 plus installation, but costs can exceed $100. This cost does not include maintenance.
- See SE-13 for Compost Sock cost information.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Silt Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.
- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

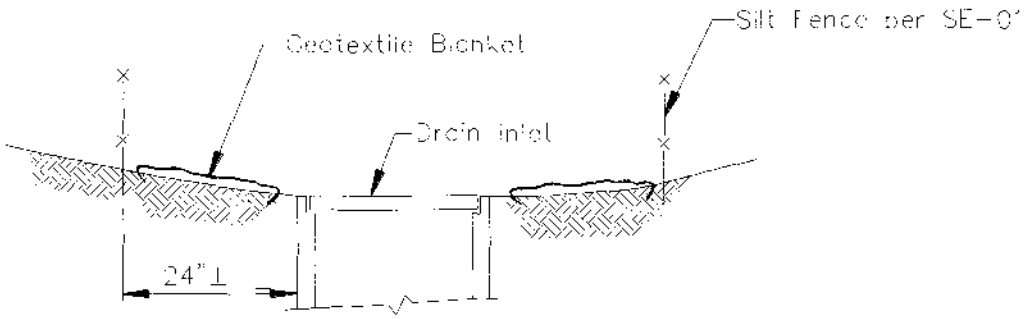
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.
- Remove storm drain inlet protection once the drainage area is stabilized.
  - Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

References

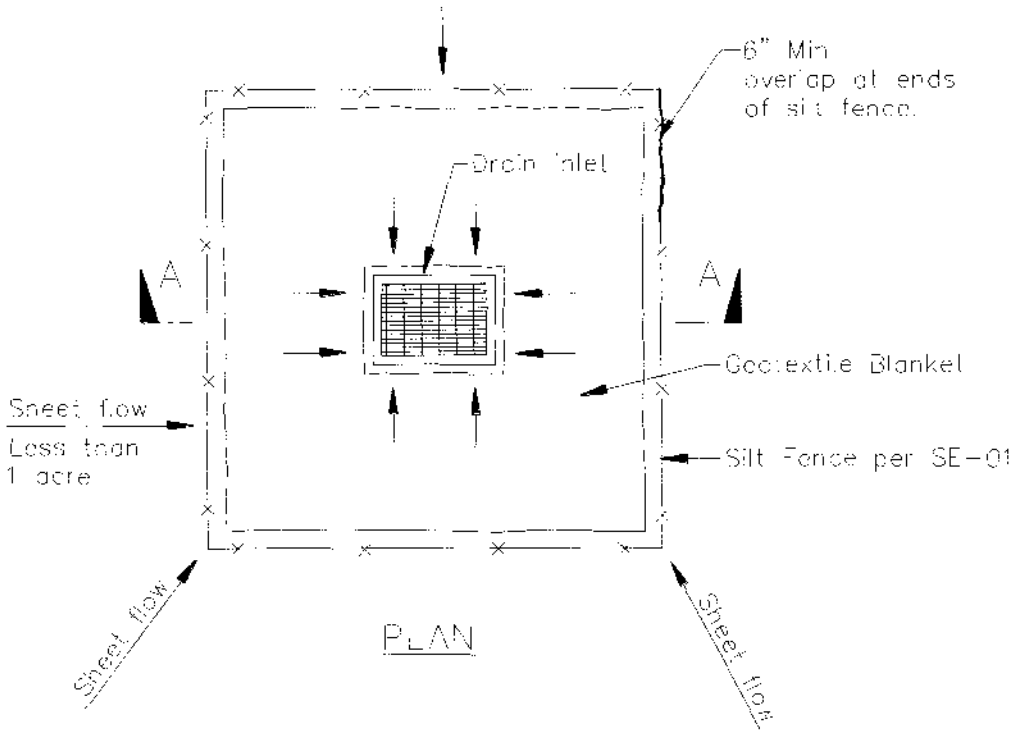
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



SECTION A-A

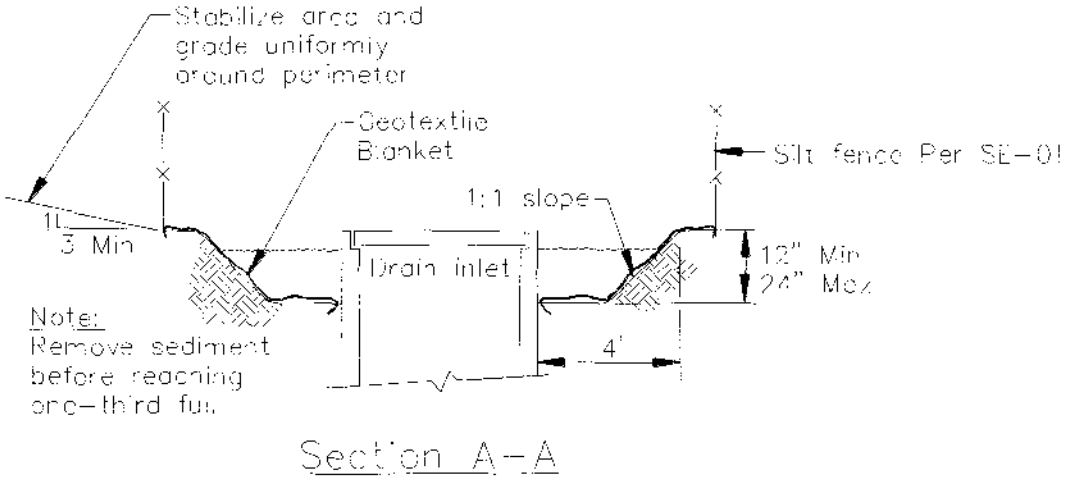


PLAN

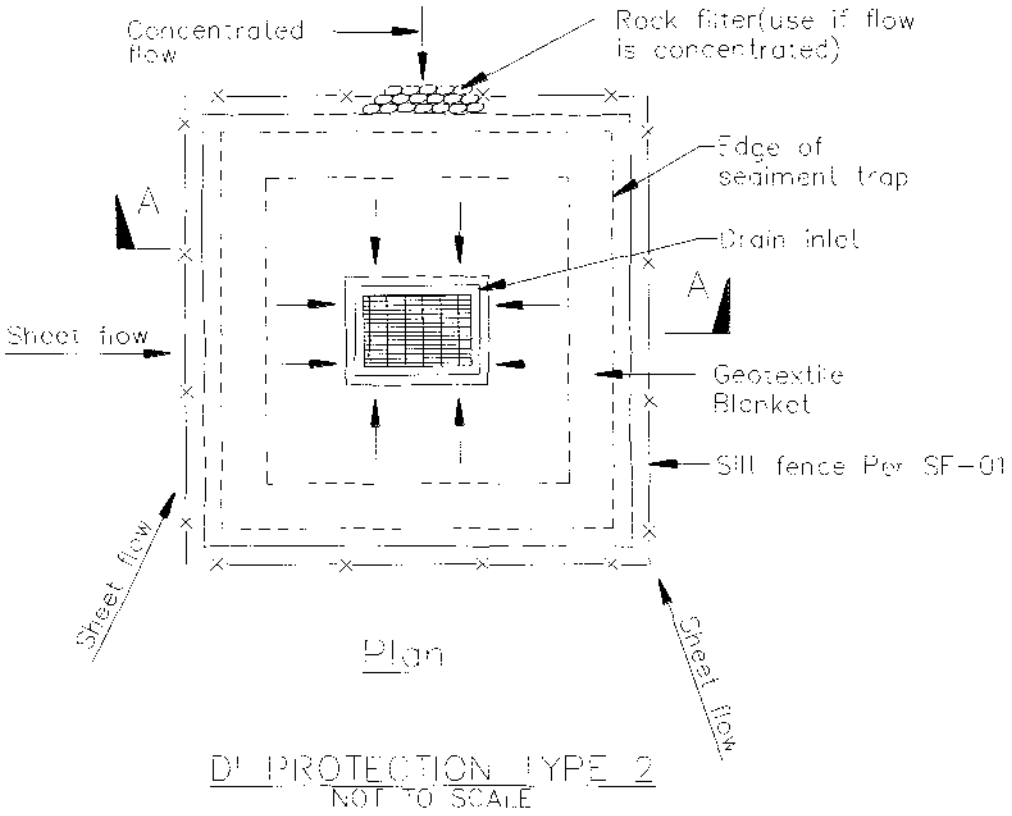
D. PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



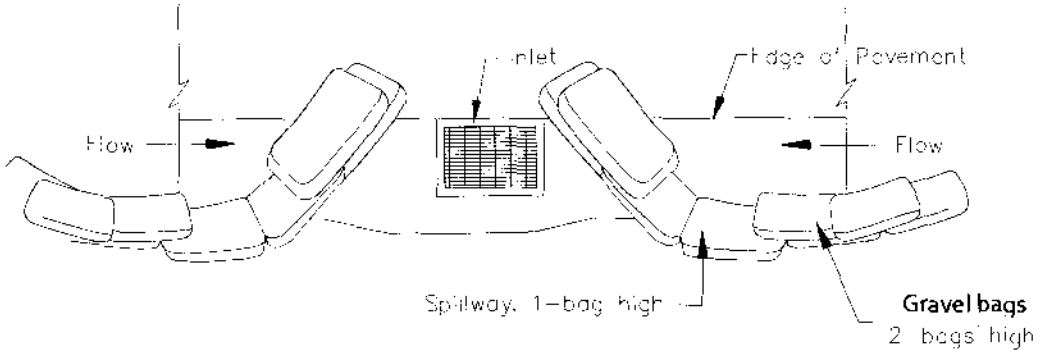
Section A-A



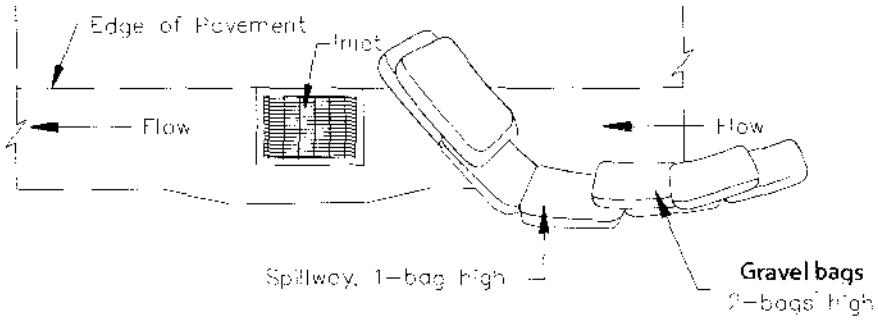
Plan

D' PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP

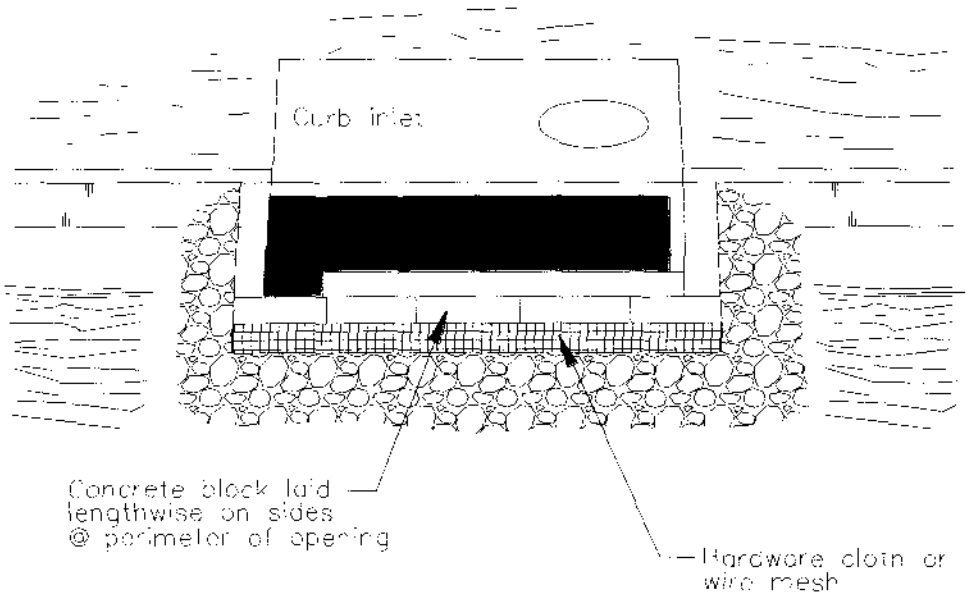


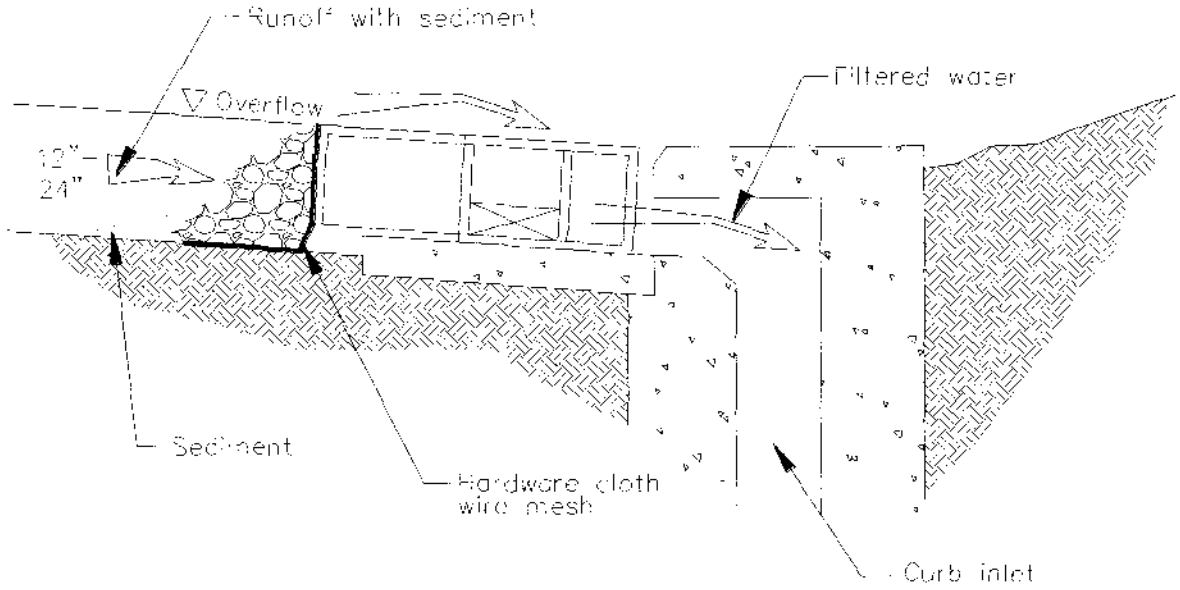
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short term use
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.
6. **Protection can be effective even if it is not immediately adjacent to the inlet provided that the inlet is protected from potential sources of pollution.**

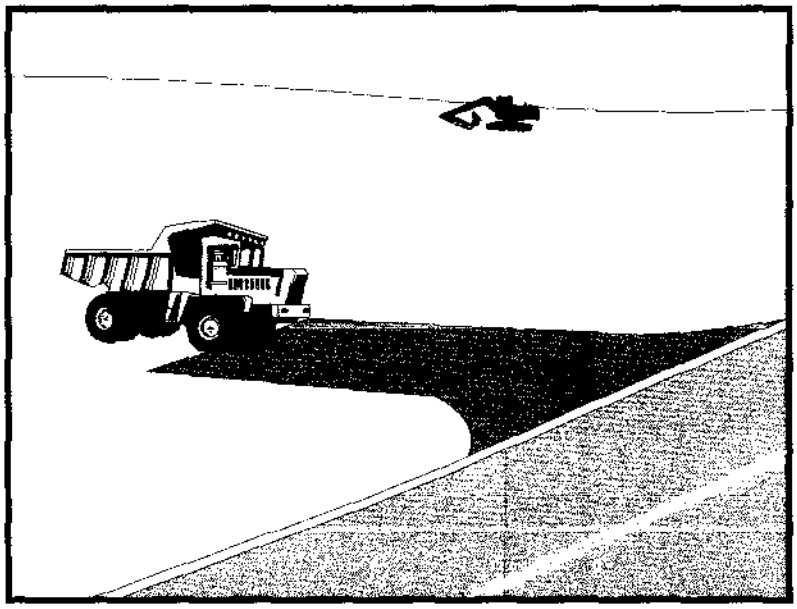
DI PROTECTION TYPE 3
NOT TO SCALE





DI PROTECTION – TYPE 4
NOT TO SCALE

Stabilized Construction Entrance/Exit TC-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Stabilized Construction Entrance/Exit TC-1

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft or maximum site will allow, and 10 ft minimum width or to accommodate traffic.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

Stabilized Construction Entrance/Exit TC-1

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

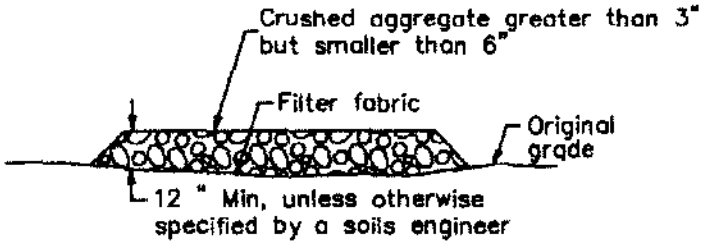
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Stabilized Construction Entrance/Exit TC-1



SECTION B–B
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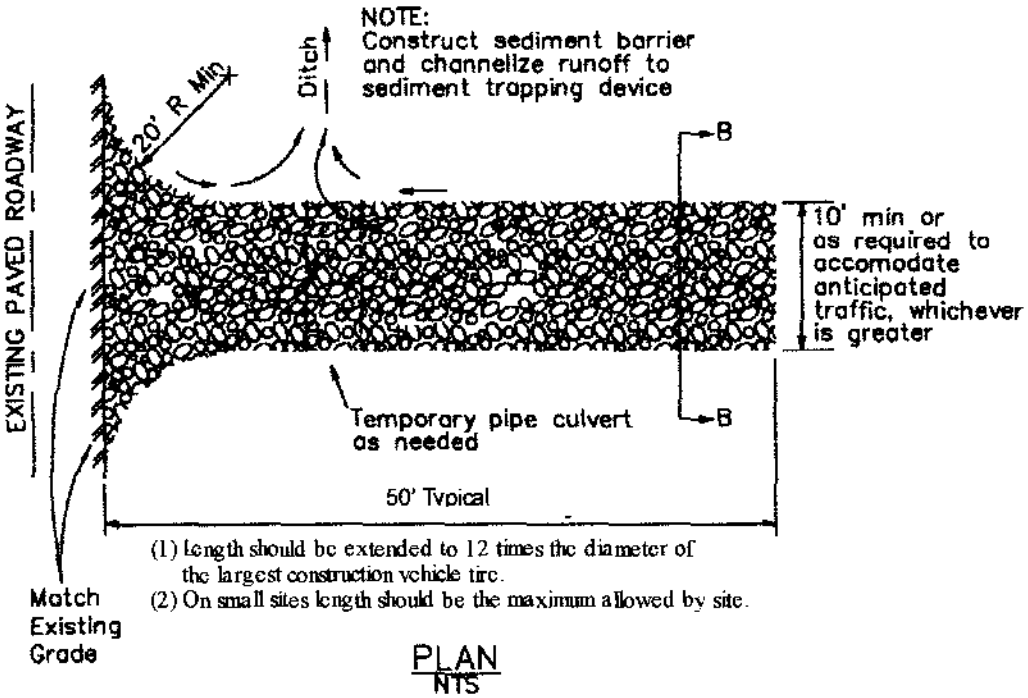
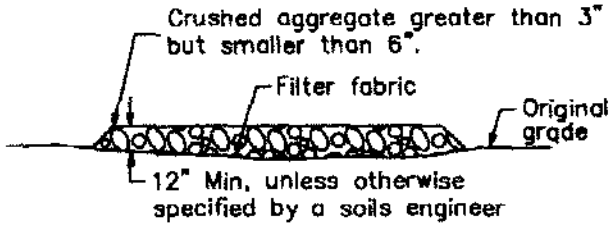


PLAN
NTS

Stabilized Construction Entrance/Exit TC-1



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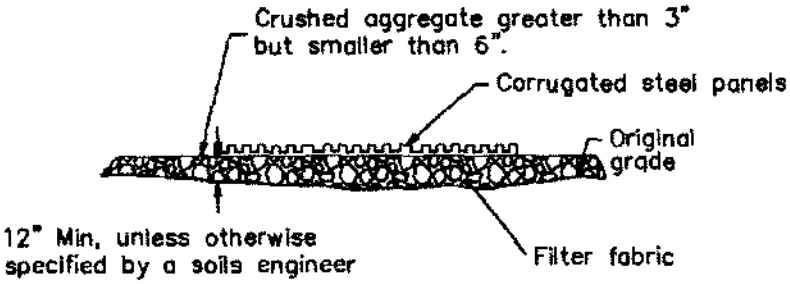

SECTION A–A
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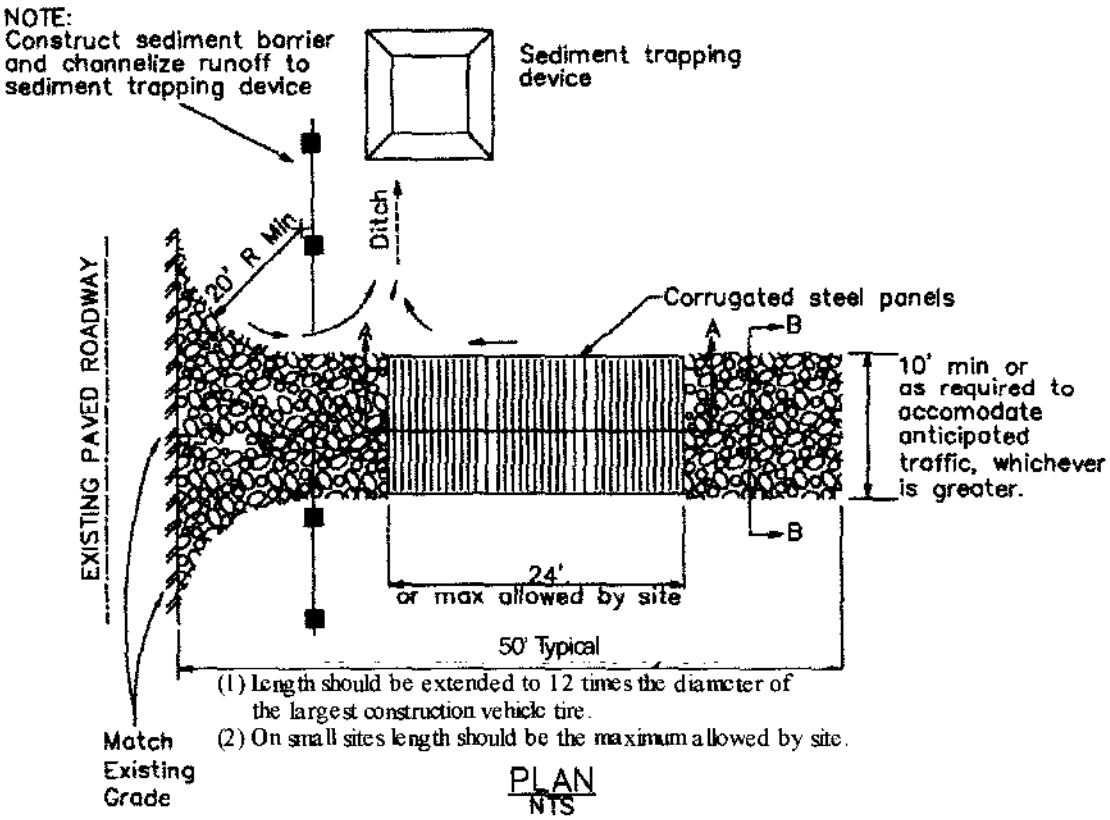

PLAN
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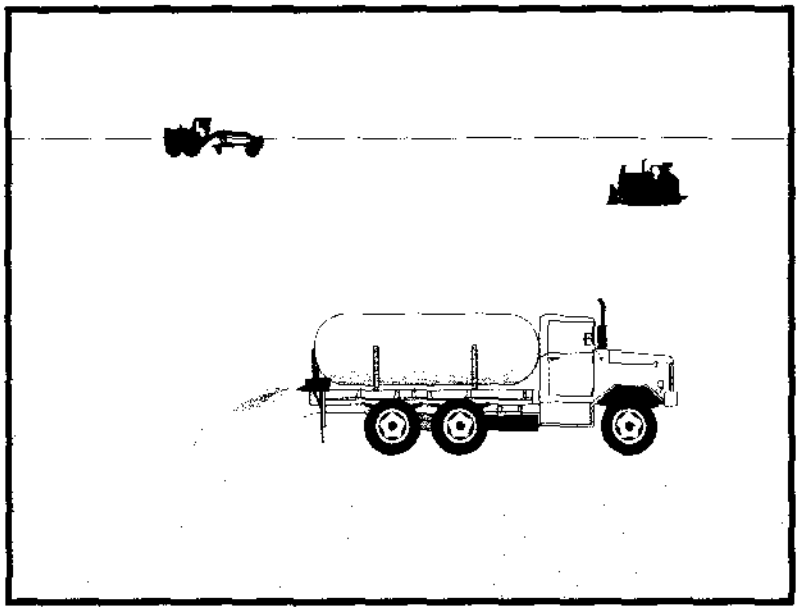
Wind Erosion Control WE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

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Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montimorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X			X
Disturbed Areas Subject to Traffic			X	X	X	X		X
Material Stockpiles		X	X	X			X	X
Demolition			X			X	X	
Clearing/ Excavation			X	X				X
Truck Traffic on Unpaved Roads			X	X	X	X	X	
Trucking					X	X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

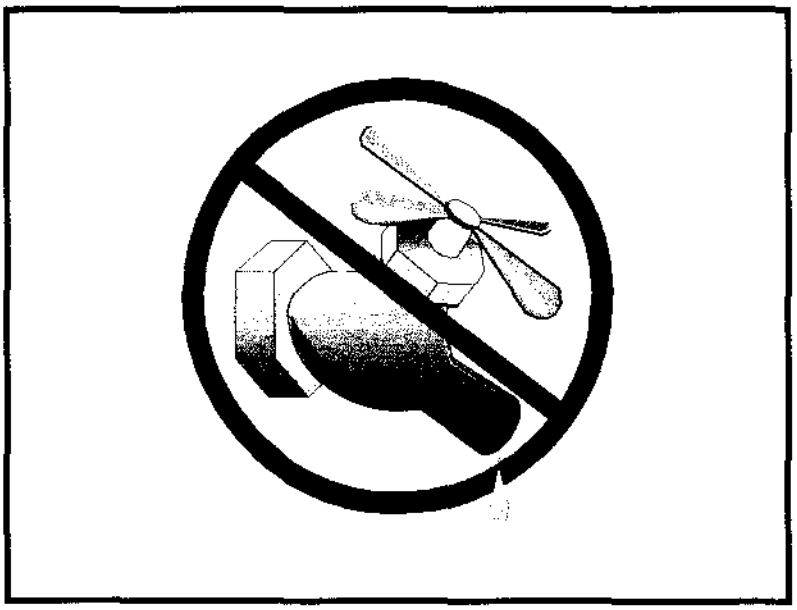
California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Water Conservation Practices NS-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.

- Direct construction water runoff to areas where it can soak into the ground or be collected and reused.
- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

Costs

The cost is small to none compared to the benefits of conserving water.

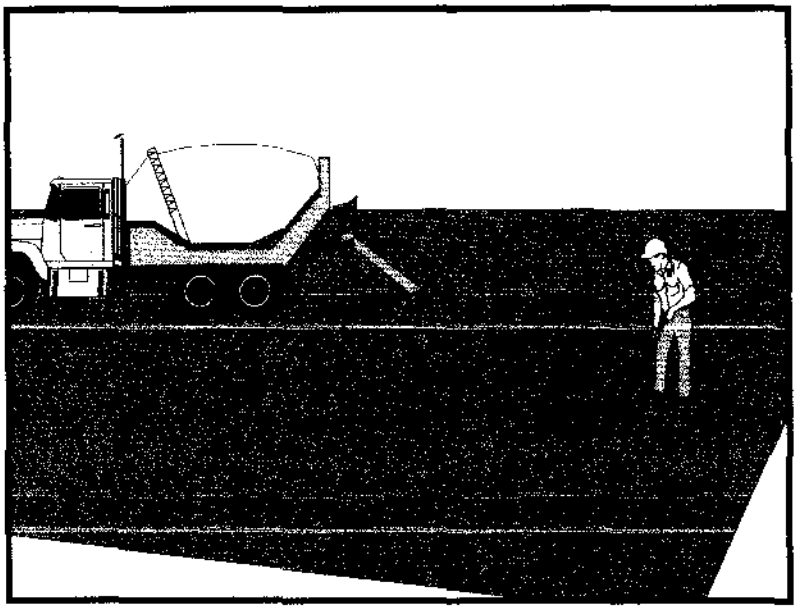
Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occuring.
- Repair water equipment as needed to prevent unintended discharges.
  - Water trucks
  - Water reservoirs (water buffalos)
  - Irrigation systems
  - Hydrant connections

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Paving and Grinding Operations NS-3



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Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.

  Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of)or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:

  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.

  - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).

- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.

- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.

- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.

- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.

- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

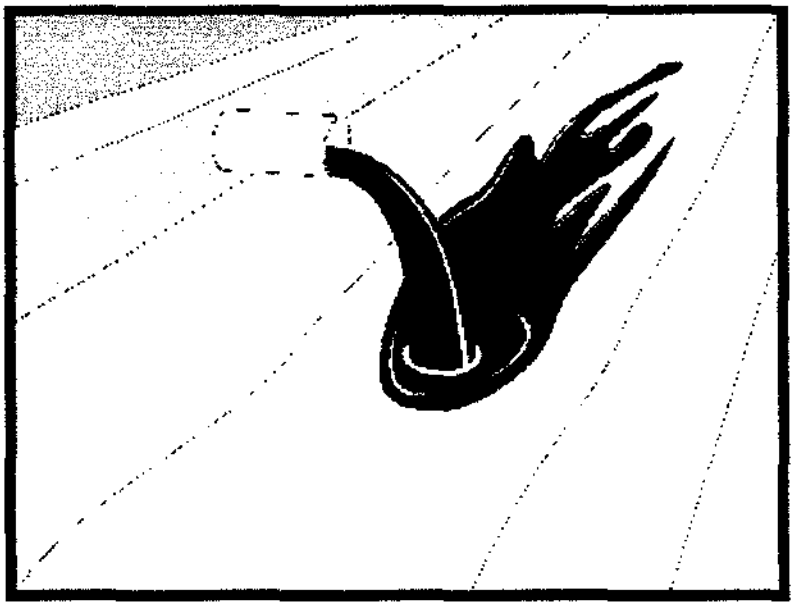
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Illicit Connection/Discharge NS-6



Categories

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SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.
- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.

- Inspect site regularly during project execution for evidence of illicit connections, illegal dumping or discharges.
- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General** – unlabeled and unidentifiable material should be treated as hazardous.
- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- **Liquids** - signs of illegal liquid dumping or discharge can include:
  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Abnormal water flow during the dry weather season
- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
  - Abnormal water flow during the dry weather season
  - Unusual flows in sub drain systems used for dewatering
  - Pungent odors coming from the drainage systems
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
  - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects
- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
  - Abnormal water flow during the non-irrigation season
  - Non-standard junction structures
  - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect the site regularly to check for any illegal dumping or discharge.
- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.
- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

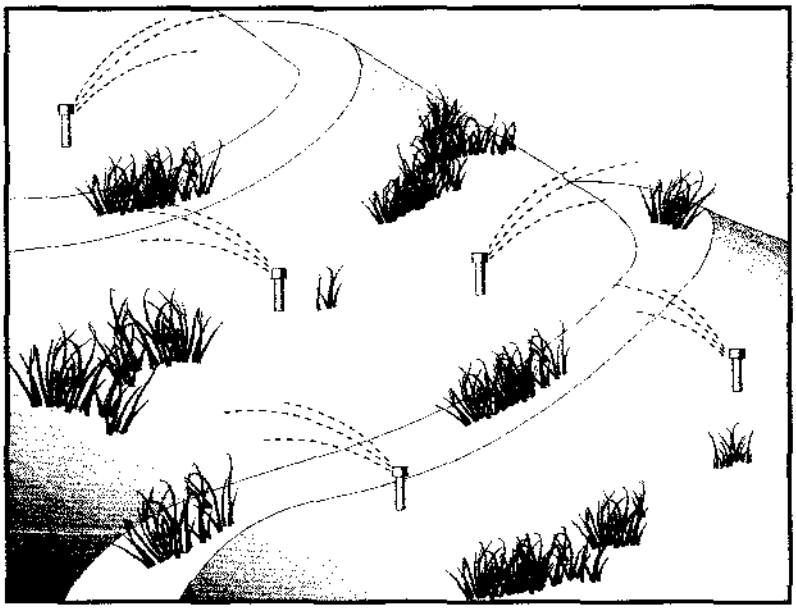
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Potable Water/Irrigation NS-7



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.

- Inspect irrigated areas within the construction limits for excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Repair broken water lines as soon as possible.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

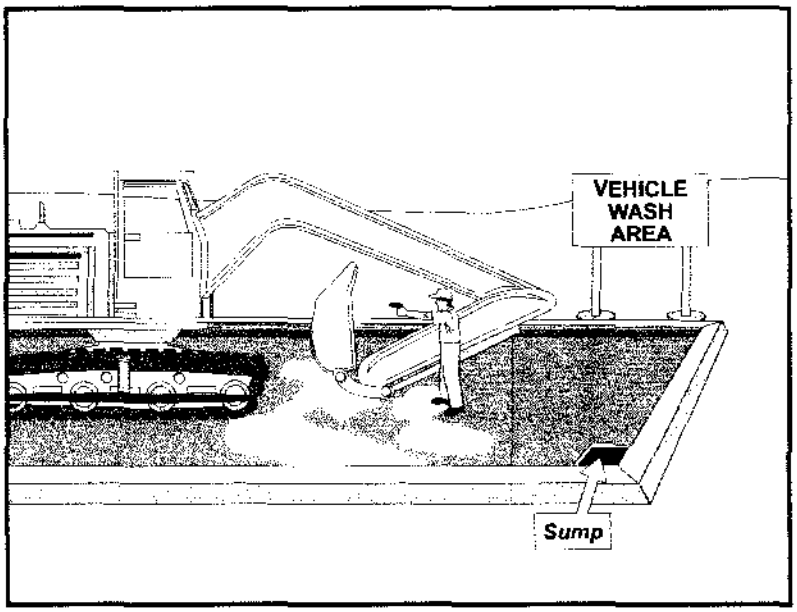
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle and Equipment Cleaning NS-8



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Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

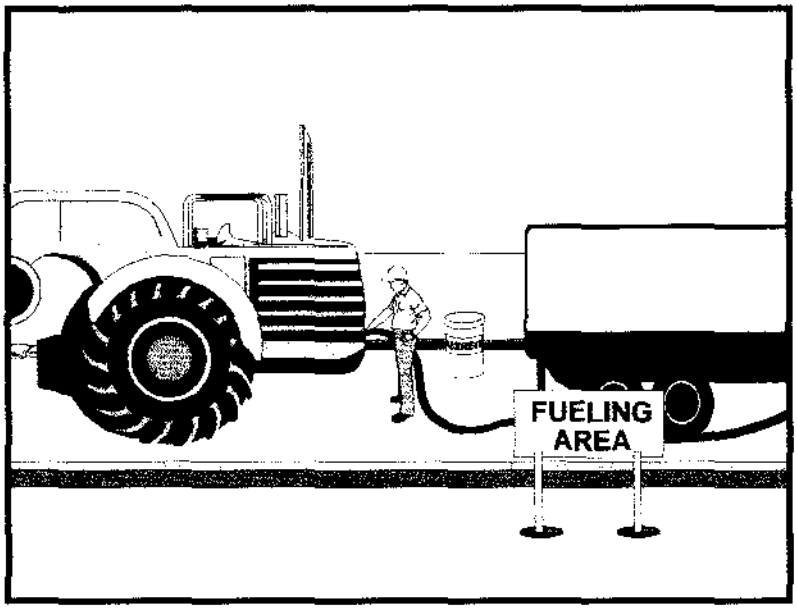
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



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Legend:

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Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

If User/Subscriber modifies this fact sheet in any way, the CASQA name/logo and footer below must be removed from each page and not appear on the modified version.

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.

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CALIFORNIA STORMWATER

- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

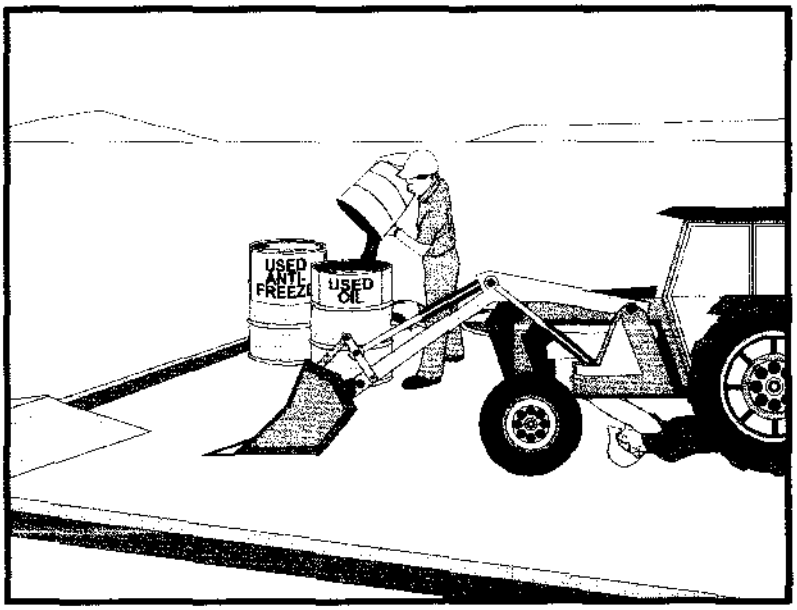
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



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Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8,

Vehicle & Equipment Maintenance NS-10

Vehicle and Equipment Cleaning, and NS-9, Vehicle and Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Vehicle & Equipment Maintenance NS-10

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

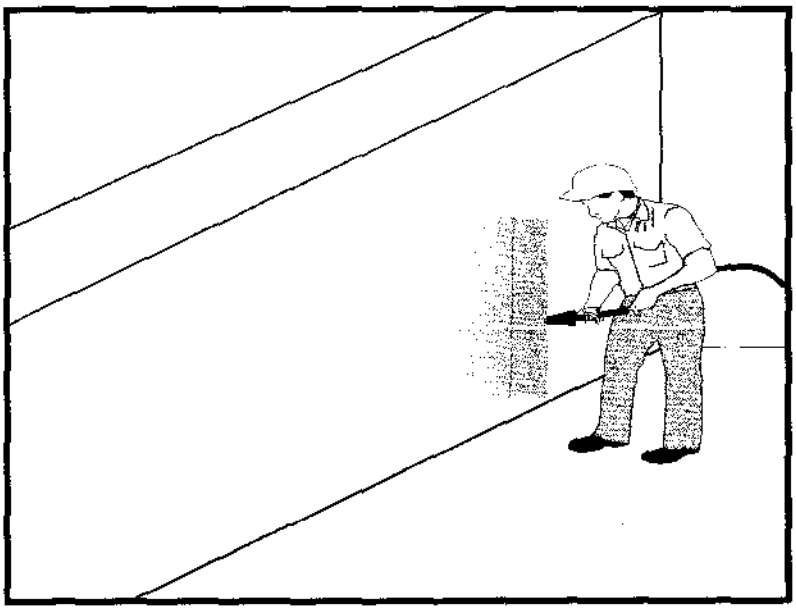
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Concrete Curing NS-12



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete and its associated curing materials have basic chemical properties that can raise the pH of water to levels outside of the permitted range. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Proper procedures and care should be taken when managing concrete curing materials to prevent them from coming into contact with stormwater flows, which could result in a high pH discharge.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

Chemical Curing

- Avoid over spray of curing compounds.
- Minimize the drift by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.
- Protect drain inlets prior to the application of curing compounds.
- Refer to WM-4, Spill Prevention and Control.

Water Curing for Bridge Decks, Retaining Walls, and other Structures

- Direct cure water away from inlets and watercourses to collection areas for evaporation or other means of removal in accordance with all applicable permits. See WM-8 Concrete Waste Management.
- Collect cure water at the top of slopes and transport to a concrete waste management area in a non-erosive manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Education

- Educate employees, subcontractors, and suppliers on proper concrete curing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete curing procedures.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Sample non-stormwater discharges and stormwater runoff that contacts uncured and partially cured concrete as required by the General Permit.
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

References

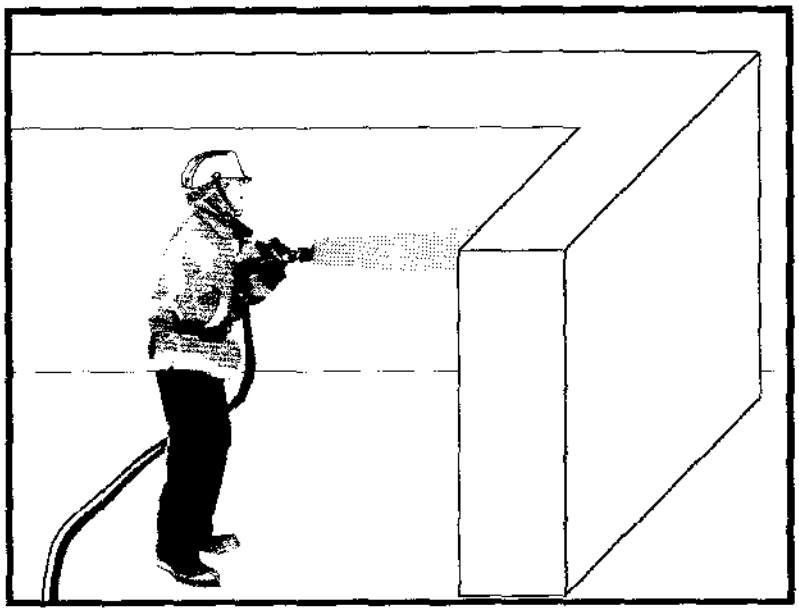
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Concrete Finishing NS-13



Categories

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☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete finishing procedures.

Costs

These measures are generally of low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

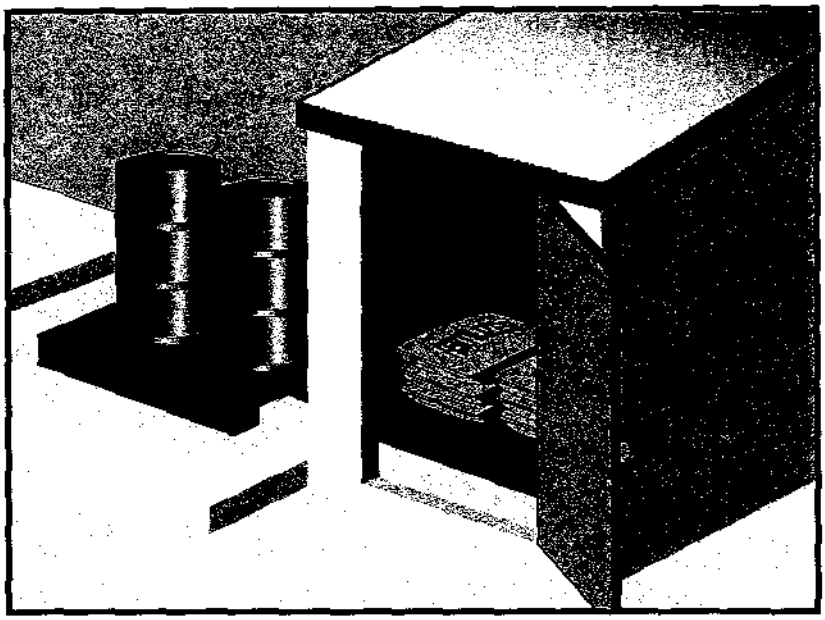
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Material Delivery and Storage WM-1



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Legend:
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☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

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- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

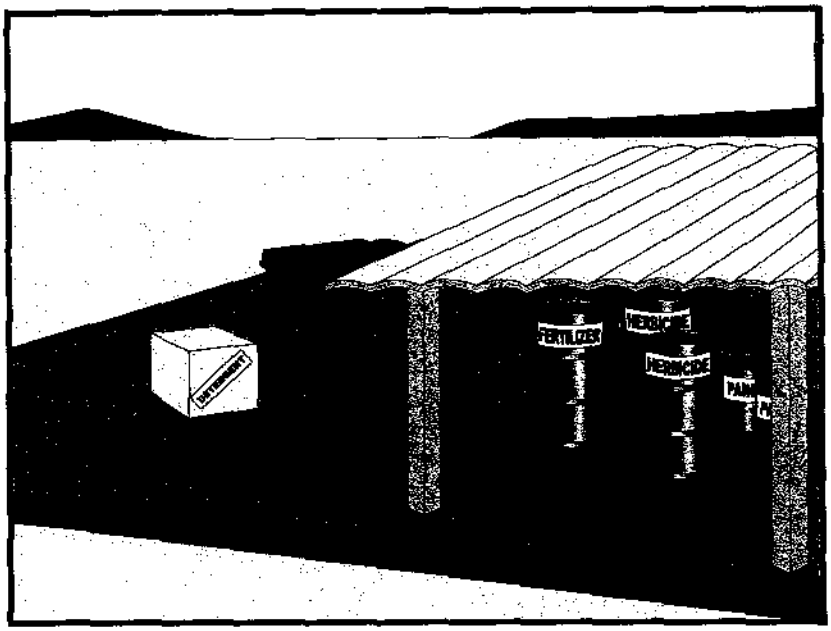
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Material Use

WM-2



Categories

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WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

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Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

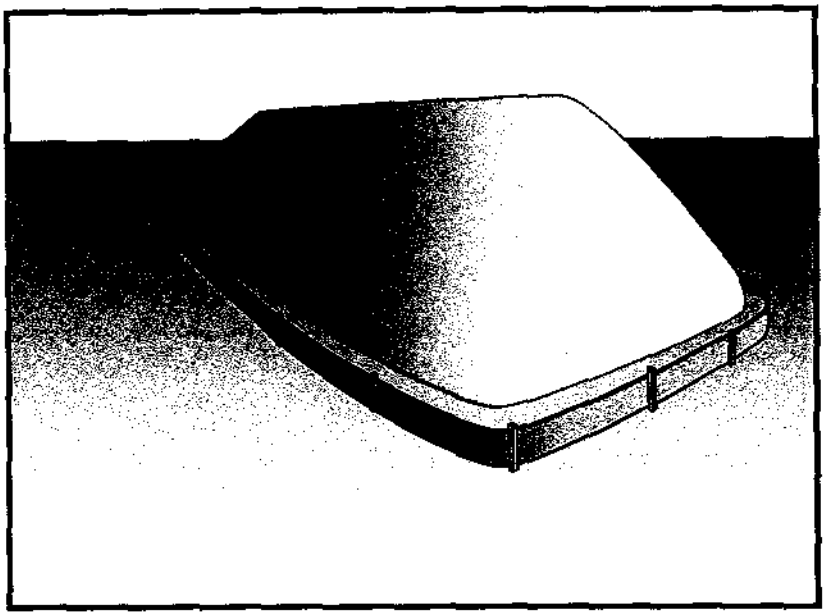
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management WM-3



Categories		
EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of Plastic materials and photodegradable plastics should be avoided.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

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- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- All stockpiles are required to be protected immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater runon using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Temporary vegetation should be considered for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Stockpiles should be covered and protected with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cold mix stockpiles should be placed on and covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Stockpiles of fly ash, stucco, hydrated lime

- Stockpiles of materials that may raise the pH of runoff (i.e., basic materials) should be covered with plastic and surrounded by a berm.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate

- Treated wood should be covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

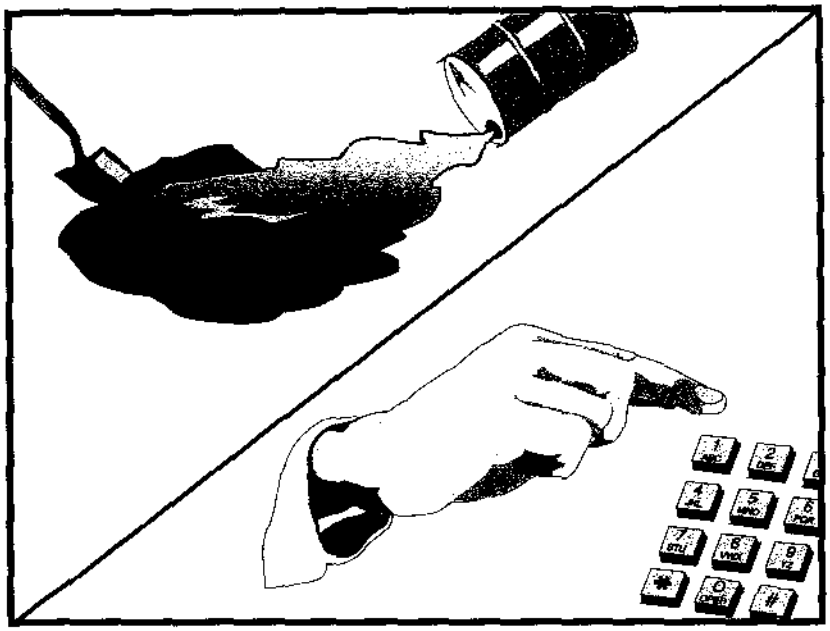
Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Spill Prevention and Control WM-4



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

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- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

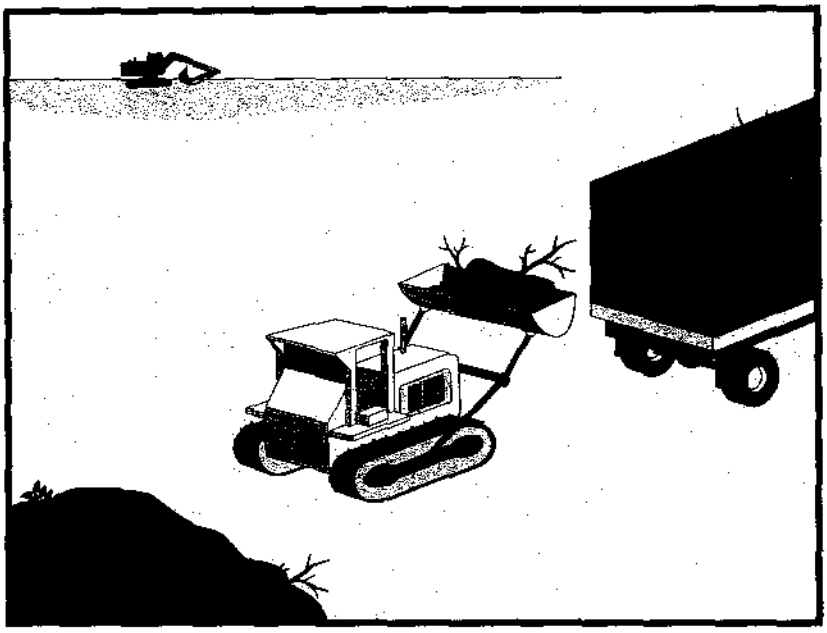
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Solid Waste Management WM-5



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials
- Highway planting wastes, including vegetative material,

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plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

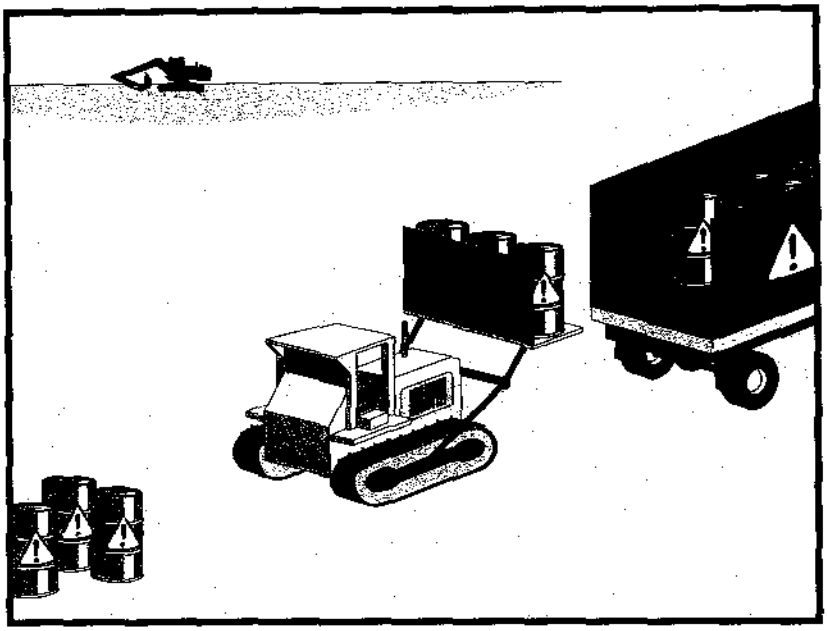
References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Hazardous Waste Management WM-6



Categories		
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SE	Sediment Control	
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WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Asphalt Products
- Concrete Curing Compounds
- Pesticides
- Palliatives
- Acids
- Septic Wastes
- Paints
- Stains
- Solvents
- Wood Preservatives
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

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In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

- Drums should not be overfilled and wastes should not be mixed.
- Unless watertight, containers of dry waste should be stored on pallets.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.
- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.
- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.
- The following actions should be taken with respect to temporary contaminant:
  - Ensure that adequate hazardous waste storage volume is available.
  - Ensure that hazardous waste collection containers are conveniently located.
  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
  - Minimize production or generation of hazardous materials and hazardous waste on the job site.
  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.
  - Segregate potentially hazardous waste from non-hazardous construction site debris.
  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.
- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

References

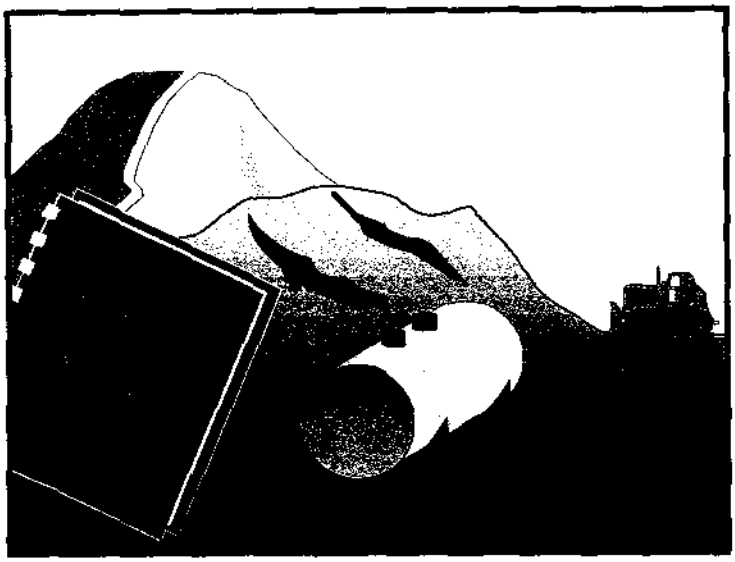
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Contaminated Soil Management WM-7



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

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plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- The contractor may further identify contaminated soils by investigating:
  - Past site uses and activities
  - Detected or undetected spills and leaks
  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements
  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
  - Suspected soils should be tested at a certified laboratory.

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations should result in no visible dust.
- Caution should be exercised to prevent spillage of lead containing material during transport.

- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.
- Test suspected soils at an approved certified laboratory.
- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- Take the following precautions if temporary stockpiling is necessary:
  - Cover the stockpile with plastic sheeting or tarps.
  - Install a berm around the stockpile to prevent runoff from leaving the area.
  - Do not stockpile in or near storm drains or watercourses.
- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat or dispose of it at an appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavate, transport, and dispose of contaminated material and hazardous material in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
  - United States Department of Transportation (USDOT)
  - United States Environmental Protection Agency (USEPA)
  - California Environmental Protection Agency (CAL-EPA)

- California Division of Occupation Safety and Health Administration (CAL-OSHA)
- Local regulatory agencies

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.
- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Costs

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

References

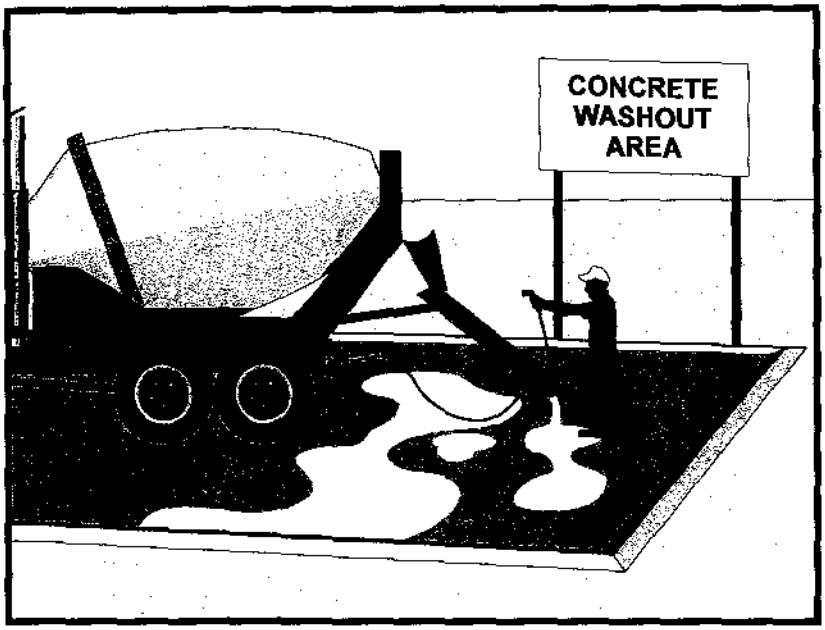
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Concrete Waste Management WM-8



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.

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- Concrete trucks and other concrete-coated equipment are washed onsite.
- Mortar-mixing stations exist.
- Stucco mixing and spraying .
- See also NS-8, Vehicle and Equipment Cleaning.

Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
  - Washout should be lined so there is no discharge into the underlying soil.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- See typical concrete washout installation details at the end of this fact sheet.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.
- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

Concrete Demolition Wastes

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.
- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).
- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.
- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
  - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
  - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
  - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a "roll-off"; this concrete washout facility should be properly sealed to prevent leakage, and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
  - Lath and flagging should be commercial type.
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations..

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures. Roll-off concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.

- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

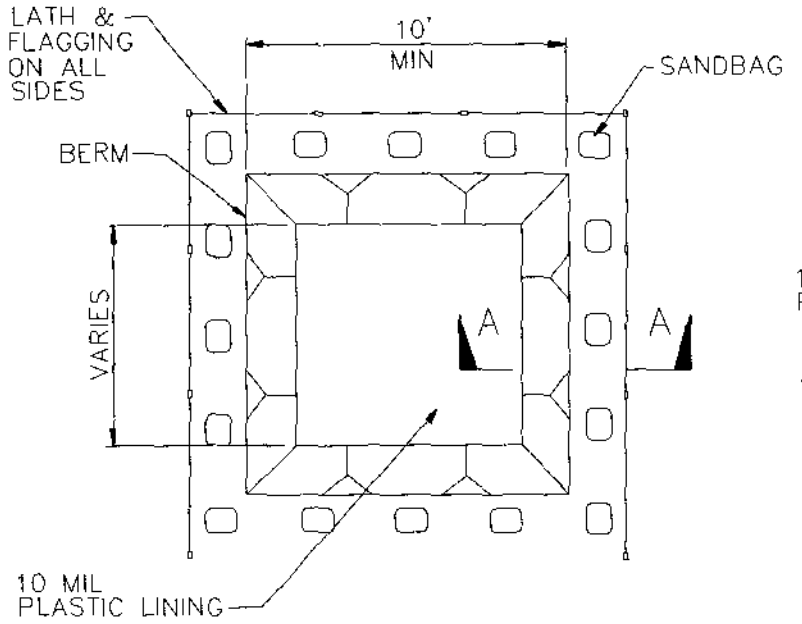
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

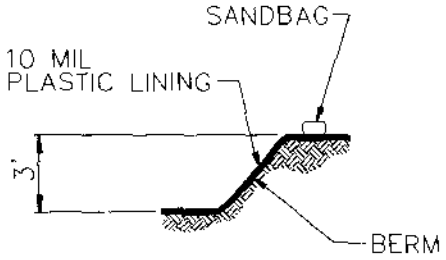
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

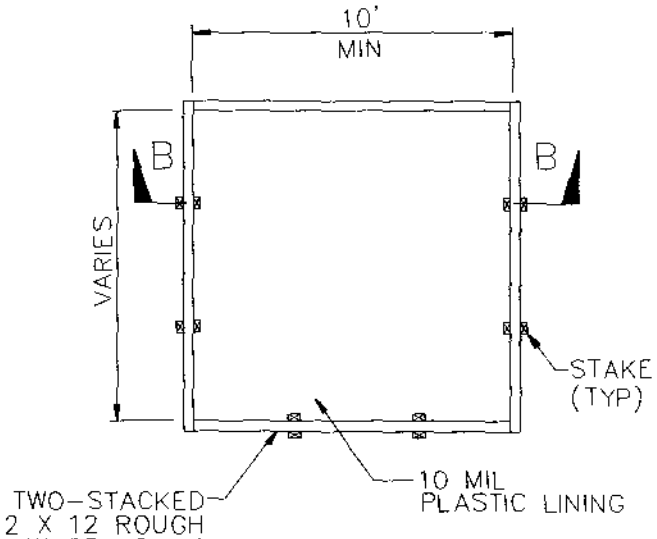
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



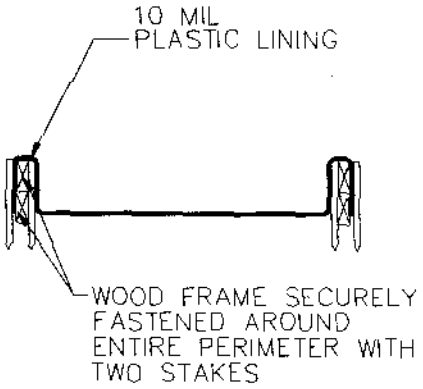
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



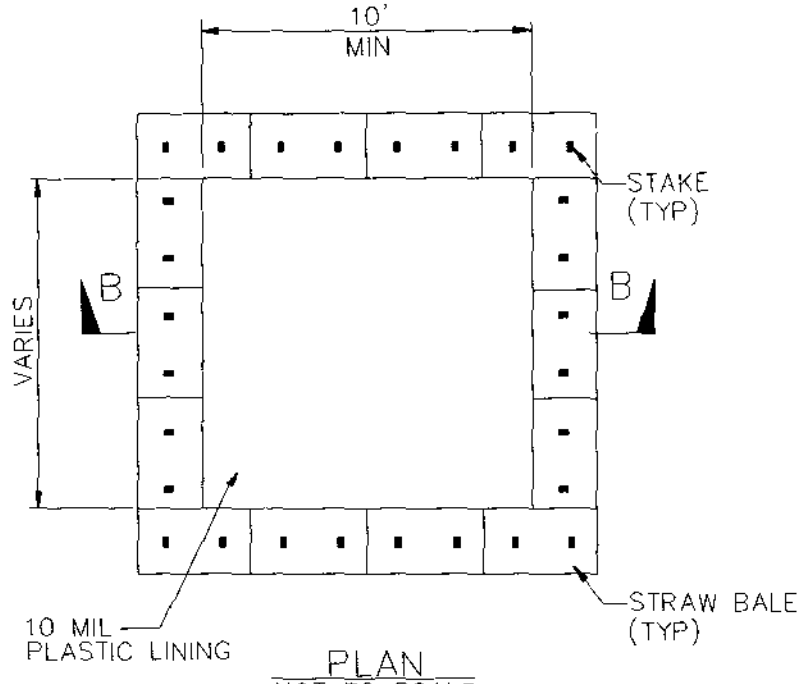
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



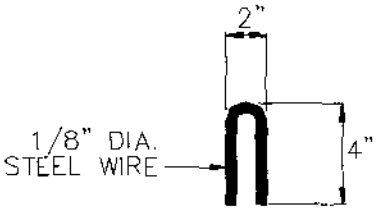
SECTION B–B
NOT TO SCALE

NOTES

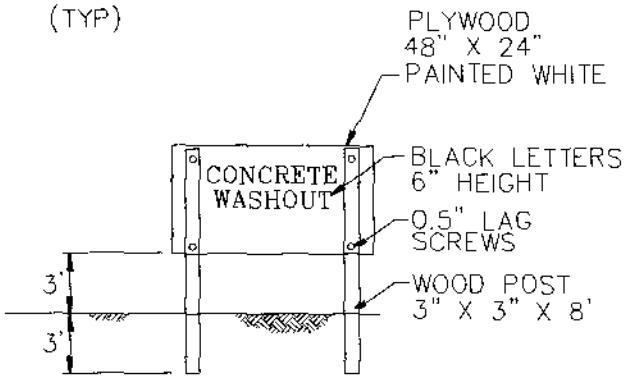
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



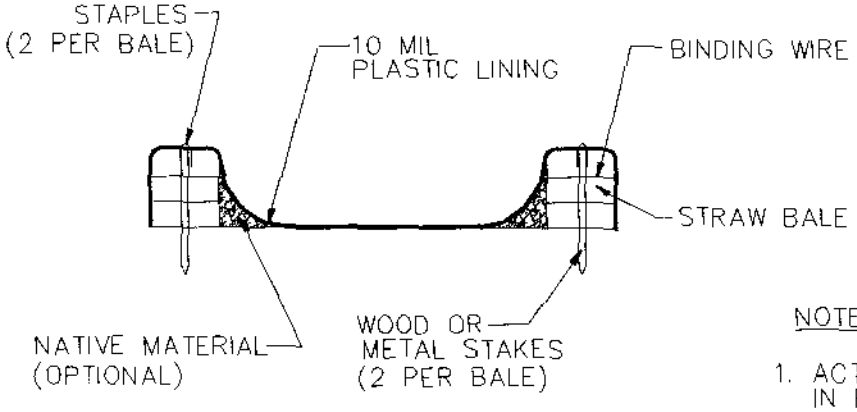
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)

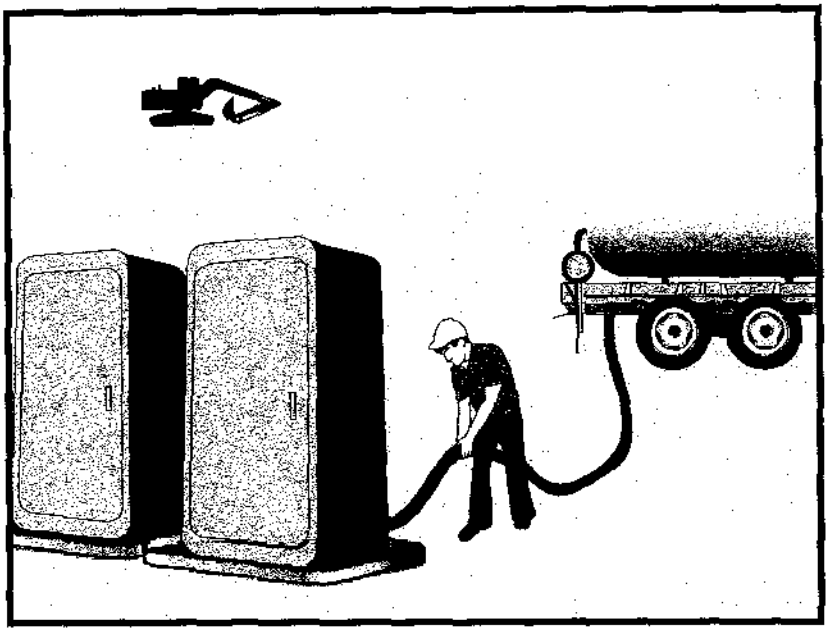


SECTION B-B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Sanitary/Septic Waste Management WM-9



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Category**
☒ **Secondary Category**

Targeted Constituents	
Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

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- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Inspection and Maintenance

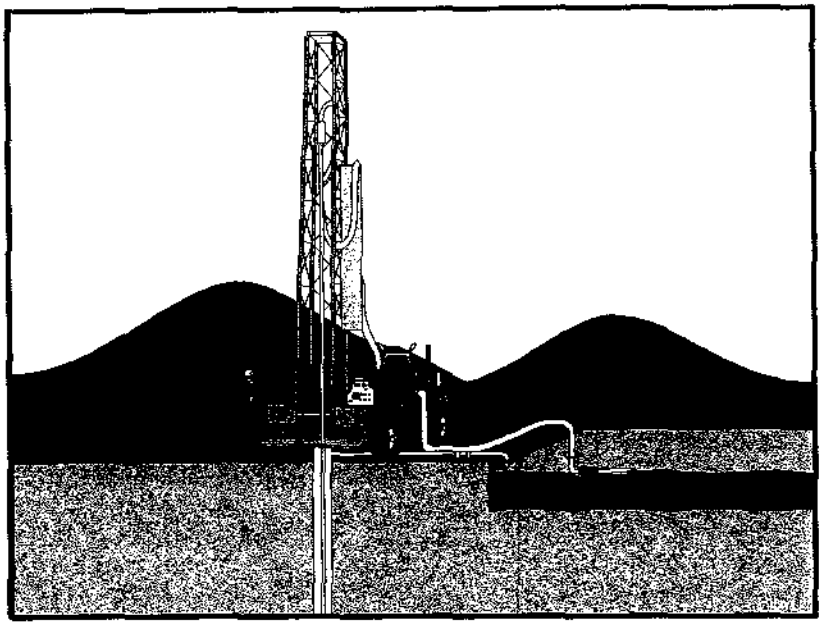
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Liquid Waste Management WM-10



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous wastes (WM-6, Hazardous Waste Management), or concrete slurry residue (WM-8, Concrete Waste

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CALIFORNIA STORMWATER

Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

Implementation

General Practices

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.
- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.
- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.
- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.

- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.

- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.

- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.

- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Costs

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.
- Inspect containment areas and capturing devices and repair as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

APPENDIX F

Construction Activity Schedule

APPENDIX G

Monitoring Record for Inspection Checklists Included in Appendix 'C'

APPENDIX H

Storm Water Requirements Applicability Checklist

City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

THE CITY OF SAN DIEGO

Storm Water Requirements Applicability Checklist

FORM DS-560
JANUARY 2011

Project Address:	Project Number *(for City Use Only)*:
University Avenue and 41st Street	

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

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)*: Brent Moore	Title: President
Signature:	Date: 7/7/14

WATER POLLUTION CONTROL PLAN

FIRE STATION NO. 17

EROSION CONTROL NOTES:

1. IN CASE EMERGENCY WORK IS REQUIRED, CONTACT _____ FROM _____ AT _____
2. DEVICES SHOWN ON CITY APPROVED PLANS SHALL NOT BE MOVED OR MODIFIED WITHOUT THE APPROVAL OF THE ENGINEERING INSPECTOR.
3. THE CONTRACTOR SHALL RESTORE ALL EROSION CONTROL DEVICES TO WORKING ORDER TO THE SATISFACTION OF THE CITY ENGINEER AFTER EACH RUN-OFF PRODUCING RAINFALL.
4. THE CONTRACTOR SHALL INSTALL ADDITIONAL EROSION CONTROL MEASURES AS MAY BE REQUIRED BY THE CITY ENGINEER DUE TO UNCOMPLETED GRADING OPERATIONS OR UNFORESEEN CIRCUMSTANCES WHICH MAY ARISE.
5. THE CONTRACTOR SHALL BE RESPONSIBLE AND SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT PUBLIC TRESPASS ONTO AREAS WHERE IMPOUNDED WATERS CREATE A HAZARDOUS CONDITION.
6. GRADED AREAS AROUND THE PROJECT PERIMETER MUST DRAIN AWAY FROM THE FACE OF SLOPE AT THE CONCLUSION OF EACH WORKING DAY.
7. ALL REMOVABLE PROTECTIVE DEVICES SHOWN SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN THE FIVE (5) DAY RAIN PROBABILITY FORECAST EXCEEDS FORTY PERCENT (40%). SILT AND OTHER DEBRIS SHALL BE REMOVED AFTER EACH RAINFALL.
8. ALL GRAVEL BAGS SHALL BE BURLAP TYPE WITH 3/4 INCH MINIMUM AGGREGRATE.
9. ALL GRADED AREAS MUST HAVE EROSION CONTROL PROTECTION BEST MANAGEMENT PRACTICE MEASURES PROPERLY INSTALLED.
10. ADEQUATE PERIMETER PROTECTION BEST MANAGEMENT PRACTICE MEASURES MUST BE INSTALLED AND MAINTAINED.
11. ADEQUATE SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES MUST BE INSTALLED AND MAINTAINED.
12. ADEQUATE MEASURES TO CONTROL OFFSITE SEDIMENT TRACKING MUST BE INSTALLED AND MAINTAINED.
13. A MINIMUM OF 125% OF THE MATERIAL NEEDED TO INSTALL STANDBY BEST MANAGEMENT PRACTICE MEASURES TO PROTECT THE EXPOSED AREAS FROM EROSION AND PREVENT SEDIMENT DISCHARGES, MUST BE STORED ONSITE. AREAS ALREADY PROTECTED FROM EROSION USING PHYSICAL STABILIZATION OR ESTABLISHED VEGETATION STABILIZATION MEASURES ARE NOT CONSIDERED TO BE "EXPOSED" FOR PURPOSES OF THIS REQUIREMENT.
14. THE OWNER/DEVELOPER/CONTRACTOR MUST HAVE AN APPROVED "WEATHER TRIGGERED" ACTION PLAN AND BE ABLE TO DEPLOY STANDBY BEST MANAGEMENT PRACTICE MEASURES TO COMPLETELY PROTECT THE EXPOSED PORTIONS OF THE SITE WITHIN 48 HOURS OF A PREDICTED STORM EVENT (A PREDICTED STORM EVENT IS DEFINED AS A FORECASTED, 40% CHANCE OF RAIN BY THE NATIONAL WEATHER SERVICE). ON REQUEST, THE OWNER/CONTRACTOR MUST PROVIDE PROOF OF THIS CAPABILITY THAT IS ACCEPTABLE TO THE CITY.
15. DEPLOYMENT OF PHYSICAL OR VEGETATION EROSION CONTROL MEASURES MUST COMMENCE AS SOON AS SLOPES ARE COMPLETED. THE OWNER/CONTRACTOR MAY NOT CONTINUE TO RELY ON THE ABILITY TO DEPLOY STANDBY BEST MANAGEMENT PRACTICE MATERIALS TO PREVENT EROSION OF SLOPES THAT HAVE BEEN COMPLETED.
16. UNLESS OTHERWISE SPECIFIED ON THE GRADING PLANS OR THE CONSTRUCTION STORM WATER POLLUTION PREVENTION PLAN DOCUMENTS, THE AREA THAT CAN BE CLEARED, GRADED, AND LEFT EXPOSED AT ONE TIME IS LIMITED TO THE AMOUNT OF ACREAGE THAT THE CONTRACTOR CAN ADEQUATELY PROTECT PRIOR TO A PREDICTED RAINSTORM. IT MAY BE NECESSARY TO DEPLOY EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES IN AREAS THAT ARE NOT COMPLETED AND ARE NOT ACTIVELY BEING WORKED BEFORE ADDITIONAL GRADING IS ALLOWED TO PROCEED, AT THE DISCRETION OF THE PUBLIC WORKS INSPECTOR.

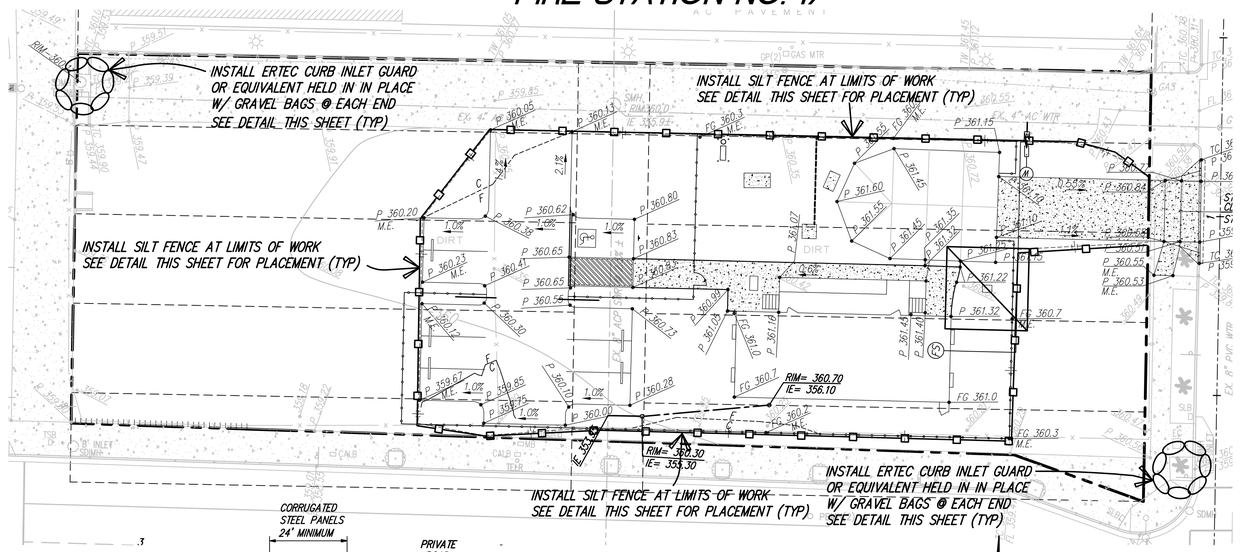
RAINY SEASON SITE MANAGEMENT REQUIREMENTS (OCTOBER 1 – APRIL 30)

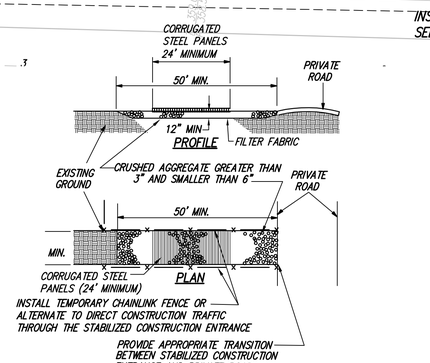
THE FOLLOWING RAINY SEASON SITE MANAGEMENT REQUIREMENTS SHALL BE ADHERED TO THROUGHOUT THE RAINY SEASON DEFINED AS BEGINNING ON OCTOBER 1 OF ANY YEAR AND EXTENDING THROUGH APRIL 30TH OF THE FOLLOWING YEAR:

1. EROSION CONTROL, PERIMETER PROTECTION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES MUST BE UPGRADED IF NECESSARY TO PROVIDE SUFFICIENT PROTECTION FOR STORMS LIKELY TO OCCUR DURING THE RAINY SEASON.
2. EQUIPMENT AND WORKERS FOR EMERGENCY WORK SHALL BE MADE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON. ALL NECESSARY MATERIALS SHALL BE STOCKPILED ON SITE AT CONVENIENT LOCATIONS TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES WHEN RAIN IS EMINENT.
3. ADEQUATE PHYSICAL OR VEGETATION EROSION CONTROL BEST MANAGEMENT PRACTICE MEASURES MUST BE INSTALLED AND ESTABLISHED FOR ALL COMPLETED SLOPES PRIOR TO THE START OF THE RAINY SEASON. THESE BEST MANAGEMENT PRACTICE MEASURES MUST BE MAINTAINED THROUGHOUT THE RAINY SEASON. IF A SELECTED BEST MANAGEMENT PRACTICE MEASURE FAILS, IT MUST BE REPAIRED AND IMPROVED, OR REPLACED WITH AN ACCEPTABLE ALTERNATE AS SOON AS IT IS SAFE TO DO SO. THE FAILURE OF A BEST MANAGEMENT PRACTICE MEASURE INDICATES IT WAS NOT ADEQUATE FOR THE CIRCUMSTANCES IN WHICH IT WAS USED. REPAIRS OR REPLACEMENTS MUST THEREFORE PUT A MORE ROBUST BEST MANAGEMENT PRACTICE MEASURE IN PLACE.
4. ALL VEGETATION EROSION CONTROL MUST BE ESTABLISHED PRIOR TO THE RAINY SEASON TO BE CONSIDERED AS A BEST MANAGEMENT PRACTICE MEASURE.
5. THE AMOUNT OF EXPOSED SOIL ALLOWED AT ONE TIME SHALL NOT EXCEED THAT WHICH CAN BE ADEQUATELY PROTECTED BY DEPLOYING STANDBY EROSION CONTROL AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MEASURES PRIOR TO A PREDICTED RAINSTORM.
6. A DISTURBED AREA THAT IS NOT COMPLETED BY THAT IS NOT BEING ACTIVELY GRADED MUST BE FULLY PROTECTED FROM EROSION IF LEFT FOR 10 OR MORE DAYS. THE ABILITY TO DEPLOY STANDBY BEST MANAGEMENT PRACTICE MEASURE MATERIALS IS NOT SUFFICIENT FOR THESE AREAS. BEST MANAGEMENT PRACTICE MEASURES MUST ACTUALLY BE DEPLOYED.

STORM WATER QUALITY NOTES – CONSTRUCTION BMP'S

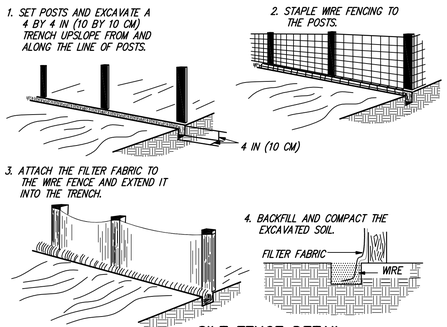
1. THIS PROJECT SHALL COMPLY WITH ALL REQUIREMENTS OF THE STATE PERMIT: CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO REGION, ORDER NO. 2009-0009-DWQ NPDES NO. CAS000002 (AVAILABLE AT HTTP://WWW.SWRCB.CA.GOV/RWQCB9/PROGRAMS/SD_STORMWATER.HTML) AND THE CITY OF SAN DIEGO LAND DEVELOPMENT CODE (HTTP://CLERKDOC.SANNET.GOV/LEGTRAIN/MC/MUNICODECHAPTER14/CH14ART02DIVISION02 AND HTTP://WWW.SANDIEGO.GOV/DEVELOPMENT-SERVICES/NEWS/PDF/STORMWATERMANUAL.PDF). NOTES BELOW REPRESENT KEY MINIMUM REQUIREMENTS FOR CONSTRUCTION BMP'S.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANUP OF ALL SILT AND MUD ON ADJACENT STREET(S), DUE TO CONSTRUCTION VEHICLES OR ANY OTHER CONSTRUCTION ACTIVITY, AT THE END OF EACH WORK DAY, OR AFTER A STORM EVENT THAT CAUSES A BREACH IN INSTALLED CONSTRUCTION BMP'S WHICH MAY COMPROMISE STORM WATER QUALITY WITHIN ANY STREET(S). A STABILIZED CONSTRUCTION EXIT MAY BE REQUIRED TO PREVENT CONSTRUCTION VEHICLES OR EQUIPMENT FROM TRACKING MUD OR SILT ONTO THE STREET.
3. ALL STOCK PILES OF SOIL AND/OR BUILDING MATERIALS THAT ARE INTENDED TO BE LEFT FOR A PERIOD GREATER THAN SEVEN CALENDAR DAYS ARE TO BE COVERED. ALL REMOVABLE BMP DEVICES SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN FIVE DAY RAIN PROBABILITY FORECAST EXCEEDS 40%.
4. A CONCRETE WASHOUT SHALL BE PROVIDED ON ALL PROJECTS WHICH PROPOSE THE CONSTRUCTION OF ANY CONCRETE IMPROVEMENTS THAT ARE TO BE POURED IN PLACE ON THE SITE.
5. THE CONTRACTOR SHALL RESTORE ALL EROSION/SEDIMENT CONTROL DEVICES TO WORKING ORDER AFTER EACH RUN-OFF PRODUCING RAINFALL OR AFTER ANY MATERIAL BREACH IN EFFECTIVENESS.
6. ALL SLOPES THAT ARE CREATED OR DISTURBED BY CONSTRUCTION ACTIVITY MUST BE PROTECTED AGAINST EROSION AND SEDIMENT TRANSPORT AT ALL TIMES.
7. THE STORAGE OF ALL CONSTRUCTION MATERIALS AND EQUIPMENT MUST BE PROTECTED AGAINST ANY POTENTIAL RELEASE OF POLLUTANTS INTO THE ENVIRONMENT.





STABILIZED CONSTRUCTION ENTRANCE

NOT TO SCALE



SILT FENCE DETAIL

NOT TO SCALE

SILT FENCE NOTES:

1. POSTS FOR SILT FENCES SHALL BE EITHER 4-INCH-DIAMETER WOOD OR EQUIVALENT WITH A MINIMUM LENGTH OF 5 FEET. POSTS SHALL BE SPACED A MAXIMUM OF 10 FEET APART AND DRIVEN SECURELY INTO THE GROUND (MINIMUM OF 12 INCHES). 2" DIA. WOOD OR EQUIVALENT MAY BE USED PROVIDED POST SPACING DOES NOT EXCEED 4'.
2. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 4 INCHES WIDE AND 4 INCHES DEEP ALONG THE LINE OF POSTS
3. THE FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE POST, AND 8 INCHES OF THE FABRIC SHALL EXTEND INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
4. THE TRENCH SHALL BE BACKFILLED AND THE SOIL COMPACTED OVER THE TOE OF THE FILTER FABRIC.
5. THE MAXIMUM DRAINAGE AREA BEHIND THE SILT FENCE SHALL BE 1.0 ACRE.
6. THE MAXIMUM SLOPE LENGTH BEHIND THE BARRIER SHALL BE 100 FEET.

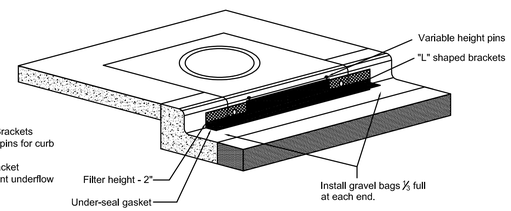
LEGEND:

DESCRIPTION	SYMBOL
STABILIZED CONST. ENTRANCE (TC-1)*	
STORM DRAIN INLET PROTECTION(SE-10)	
SILT FENCE (SE-1)	
STREET SWEEPING & VACUUMING (SE-7)*	SSV
CONCRETE WASHOUT FACILITIES (WM-8)*	CWF
STOCKPILE MANAGEMENT (WM-3)*	STM
VEHICLE STORAGE & SERVICE AREA (NS-8, 9, & 10)*	VEH
WASTE MANAGEMENT FACILITIES (WM 5 & 10)*	WMF
EQUIPMENT STORAGE & SERVICE AREA (NS-8, 9, & 10)*	EQUIP
MATERIAL DELIVERY AND STORAGE (WM-1)*	MDS
SPILL PREVENTION & CONTROL (WM-4)*	SPILL
CONCRETE WASTE MANAGEMENT (WM-6)*	CONC
WATER CONSERVATION PRACTICES (NS-1)*	WATER
PAVING AND GRINDING OPERATIONS (NS-3)*	P&G
CONTAMINATED SOIL MANAGEMENT (WM-7)*	CSM
HAZARDOUS WASTE MANAGEMENT (WM-8)*	HWM
MATERIAL USE (WM-2)*	MATL
SANITARY/SEPTIC WASTE MANAGEMENT (WM-9)*	SEP
WATER CONSERVATION PRACTICES (NS-1)*	WTR

* CONTRACTOR TO DETERMINE LOCATION(S) IN FIELD, LOCATIONS MAY CHANGE THROUGHOUT THE DURATION OF CONSTRUCTION. SEE CALIFORNIA STORMWATER BMP HANDBOOK FOR ADDITIONAL INFORMATION.

P1 Slope Details

ERTEC® Curb Inlet Guard™
Details



Construction Details
* Minimum 2 integrated "L" Brackets
* Minimum 2 variable-height pins for curb
* Filter height = 2 inches
* UV resistant HDPE outer jacket
* Under-seal gasket to prevent underflow
* CIG height = 8 inches
* CIG length = 6.25 feet

Installation Details
* **Placement:** place CIG tightly against drain opening with metal variable height pins at top.
* **Change height for high openings:** extend variable height pins upward if necessary.
* **Interconnecting for long curb openings:** overlap segments so the bottom gasket provides a continuous seal (one side has a cut-out). Each 6.25" segment fits a 5 foot opening or smaller. Use 2 segments for 8 to 10 feet. Use 3 segments for 15 feet, etc.
* **Anchoring:** install gravel bags at each end and at overlaps. Use ½ full gravel bags for low profile and best traffic avoidance. Use clean gravel at drain inlets - not sand. Select bags with long term UV exposure and toughness for resistance to traffic. Where not possible to install gravel bags due to traffic proximity, it is acceptable to anchor with concrete anchors, or masonary nails - one at each end. Anchor Curb Inlet Guard so that water cannot flow behind it. Use 1" washers.

Inlet Size	# of CIG Segments
5'	1
10'	2
15'	3
20'	4
25'	5
30'	6

** NOT TO SCALE **		
ERTEC Environmental Systems (http://www.ertecenvironmental.com)	ERTEC - Installation Details - Curb Inlet Guard.dwg	
1150 Ballena Blvd, Suite 250 Alameda, CA 94501	P. 866-921-0724 F. 510-521-3972	P1 Details
	8.5" x 11"	1 of 1

BENCHMARK

DESCRIPTION: UNIVERSITY AVE AND 41ST STREET – NE BRASS PLUG

RECORD FROM: CITY OF SAN DIEGO BENCH MARK

ELEVATION: 360.137 DATUM M.S.L.

Alidade ENGINEERING
28441 RANCHO CALIFORNIA ROAD, SUITE 100
TEMECULA, CA 92590
PH: (951) 587-2020
FAX: (951) 587-2626

REGISTERED PROFESSIONAL ENGINEER — BRENT C. MOORE — No. 59121 — Exp. 6-30-15 — CIVIL — STATE OF CALIFORNIA

BY: _____ DATE: _____
BRENT C. MOORE
R.C.E. NO.: 59121 REGISTRATION EXPIRATION DATE: 6-30-2015

10-121WPCP-GPTEMP.dwg 12-06-13

APPENDIX G

LEED COMMISSIONING

Owner's Project Requirements

Fire Station No. 17
City Heights

Plan prepared by:

San Diego Fire-Rescue
3902 Ninth Avenue
San Diego, California 92103

May 01, 2015

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

Table of Contents

1. Introduction

In accordance with sustainability goals of the City of San Diego, Fire Station No. 17 shall be designed and built to achieve a minimum Silver rating under the United States Green Building Council's Leadership in Energy and Environmental Design for Green Building Design and Construction 2009 Edition (LEED-NC 2009)

To convey project specific goals and requirements to the design team an Owner's Project Requirements (OPR) document is developed by the owner in collaboration with the commissioning authority, project team, facility staff, and building users. This document may be updated by the owner as design and construction progress.

In addition to being a LEED-NC 2009 requirement, this document serves as the foundation on which the design team develops the Basis of Design document. In addition, the OPR provides a baseline for evaluating those aspects of the project most important to the owner such as energy, sustainability, indoor environmental quality, and maintainability.

2. Owner and User Requirements

2.1 Project Description

Originally constructed in 1924, and relocated in 1950, Fire Station 17 serves City Heights and the surrounding areas. The project replaces an existing and outdated fire station on an urban site with a three-story structure of 10,757 square feet. It will contain 10 dormitory rooms, a kitchen / dining room, dayroom, reception / watch room, exercise room, locker / laundry, clean room, elevator and two and half bays for apparatus bays.

The building is an "Essential Facility," as defined in the California Building Code. It shall be constructed to the highest standards to allow continued operation under extremely adverse conditions. It shall also be designed to facilitate its primary mission: the rapid response of the emergency personnel and vehicles stationed within.

3. Environmental and Sustainability Goals

The City of San Diego is dedicated to sustainable building practices and requires all new construction projects and major renovations to demonstrate energy efficiency, green building, and sustainable measures. As part of this commitment, this project is pursuing Silver certification under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Building Design and Construction 2009 Edition rating system.

In addition to a LEED Silver certification, the project will comply with the City of San Diego Sustainable Building Policy (900-14). The Sustainable Buildings Policy shall recognize projects that are designed, constructed and operated using cost-effective innovative strategies and technologies that seek to achieve the following:

- Avoid permanent adverse impact on the natural state of the air, land and water;
- Ensure a healthful indoor environmental quality;
- Optimize social and economic benefits to the project and the community; and
- Encourage occupant behavior, maintenance and operations that maximize conservation opportunities, reduce resource consumption and minimize wastes.

In order to achieve the goals Fire Station 17:

1. Will be developed in an urban area with existing infrastructure to protect greenfields and preserve habitat and natural resources.

2. Promote alternative transportation including; access to public transportation, providing bicycle storage areas and showers, providing preferred parking for low-emitting and fuel-efficient vehicles, and by not exceeding minimum local zoning requirements for parking capacity.

3. Limit the disruption of natural hydrology by reducing impervious cover, increasing on-site infiltration, reducing or eliminating pollution form stormwater runoff, eliminating contaminants, and managing stormwater runoff.

4. Minimize heat island impacts on microclimates and human and wildlife habitats.

5. Use less water.

6. Use water efficient landscaping.

7. Use less total building energy consumption than the minimally code compliant building as modeled following the Title 24 requirements.

8. Divert construction and demolition debris from landfills and incineration facilities by recycling and / or salvaging of non-hazardous construction and demolition debris.

9. Use materials with recycled content.

10. Use building materials and products that come from the local region.

11. Will provide additional outdoor air ventilation to improve indoor air quality (IAQ) promoting occupant comfort, well-being, and productivity.

12. Will improve indoor air quality by reducing contaminants from all occupied spaces by using low-emitting volatile organic materials, including adhesives, paints, coatings carpet systems, composite wood and agrifiber products.

13. Will provide a high level of thermal comfort control by individual occupants or groups promoting productivity, comfort, and well-being.

14. Will provide a comfortable thermal environment by designing the heating, ventilating, and air conditioning systems.

The complete LEED scorecard current at the time this document was developed is provided in Section 8 of this document.

4. Energy Efficiency Goals

Designing energy efficiency into new buildings is important to the City of San Diego not only to lower annual operating costs but to reduce the City's impact upon the environment. At a minimum the building is required to exceed California Energy Code Title 24 efficiency standards by 34%.

Outlined in the Fire Station and Facilities Design and Construction Standards, dated 2/09/11 the following strategies will be incorporated as applicable to meet the energy efficiency goals:

- Natural day lighting will be provided whenever possible, especially in hallways, restrooms, common areas and apparatus floor.
- Every effort will be made to limit the use of non-standard light bulbs.
- Lighting fixtures will be equipped with timed motion sensors with temporary override capability.
- Exterior lighting shall be timer controlled with energy efficient fixtures, controlled by photocell in series with a switching ability.
- Windows shall have dual paned, high performance, low-E glass with weather-tight frames, sashes and seals.
- Heat Pump conditioning (heating and cooling) shall be provided in living areas as required to maintain 68°F to 72°F.
- Provide low maintenance, drought tolerant landscaping with high-efficiency irrigation systems and automatic timers.
- Rain Harvest system to reduce water use for toilets.
- PV integral roof top system

5. Indoor Environmental Quality Requirements

Area	Intended Use	Occupancy Schedule	Space Environmental Requirements	Desired Adjustability of Systems	After Hours Use
Watch Room/ Reception	2 works stations & place to greet visitors	24 hours/day	-	-	-
Apparatus Bays	House 2 pumper/engines, 1 ambulance	24 hours/day	Passive & positive ventilation w/ tailpipe exhaust extraction system, some lighting on at all times, automatic lights when alert signals.	Yes	N/A
Clean (wash) Room	To wash medical equipment, household mop. (Note: SDFD Equipment tends to refer to hoses)	After returning from incident	-	-	N/A
Work Room	Repair equipment	Available 24 hrs/day	-	-	-
Day Room/Bullpen	Place for crew to watch TV/movies/training		-	-	-
Electrical/ Rooms	House electrical sub panels (1) closet.	Available 24 hrs/day	-	-	-
Locker Room	Store and wash Fire-fighting turn-out gear	Available 24 hrs/day	Vented to the exterior, passive & positive ventilation	?	N/A
Weight Room	Exercise and workout space	Available 24 hrs/day	HVAC		
Communication Room	House TV, data, alert system and communication equipment (1) closet				
Dorms	Sleeping rooms w/ personal storage lockers and desk	24 hrs/day	Ability to darken room and higher acoustical requirements, task lighting at bed and desk	Yes	
Kitchen	Store, prepare, and serve meals	24 hrs/day	Range hood		
Dining	Eat meals	24 hrs/day	Open to Kitchen		
Bathrooms	Private for captains, single occupancy for	24 hrs/day	Water saving fixtures		

Area	Intended Use	Occupancy Schedule	Space Environmental Requirements	Desired Adjustability of Systems	After Hours Use
	Male/Female for fire fighters				

Please note that fire, smoke and carbon monoxide detectors and sprinkler system shall be installed as required by the UBC for Group R occupancies.

6. Equipment and System Expectations

Mechanical HVAC equipment will consist of packaged rooftop units with economizer cycles and 30% pleated filters. Units shall be controlled via a DDC peer-to-peer network with central override and interface. Rooftop unit controllers shall be solid state microprocessor based controlling all associated functions, and be capable of stand-alone or networked operation. Software functions shall utilize pre-tested and pre-configured algorithms resident in the unit memory with error reduction logic. Demand control ventilation controls shall be provided for units serving the dining and lounge common areas. Combination smoke/fire dampers shall be provided for area occupancy separation and smoke detectors to be located in supply ducts for unit shut down.

Exhaust systems will be central belt drive centrifugal up-blast fans ducted to each restroom etc. Exhaust fans will be interlocked to operate with the associated A/C system. The A/C systems shall be designed to make-up the required exhaust quantities and the exhaust volumes shall maintain the minimum outside air for each space. The fans shall sit on vibration isolation curbs with seismic restraints to minimize noise transfer into the building. Apparatus Bay ventilation systems consist of general exhaust with overhead inlets and low wall inlets. In addition there shall be a direct vehicle exhaust system provided by an outside vendor. Engineered air devices for supply, return, and exhaust are provided for efficient quiet air flow in the space.

Plumbing fixtures shall be selected based on their ability to conserve water. Toilets to be low flow (1.8 GPF), faucets are also to be low flow. Automated timers shall shut down domestic hot water recirculation pumps when loop temperature is adequate or during times when hot water is not needed. Hot water piping shall be insulated.

Energy efficient lighting shall be provided for comfort and safety. Most lighting fixtures shall be fluorescent except for specialty LED life safety or HID exterior. The interior lighting system must be energy efficient, simple in design and construction, meet LEED standards/intent for Silver rating, utilize the latest technology and practice used in green office space lighting, and provide for maximum occupant comfort promoting productivity.

Considerations shall include designing and selecting lighting equipment/fixtures, occupancy based lighting controls, automated natural daylight controls, prevention of direct and reflected glare, and space gloom. Brightness of Space (luminance) of the room surfaces shall be as follows; Offices – 30 fc, Corridors – 10 fc, all other spaces – as recommended by IESNA. Receptacles for task lighting must be provided in all spaces with lighting levels less than 40 foot-candles. CFL or LED light to be used for all task lighting fixtures and lighting load calculations. Reflected Glare – as recommended by IESNA. Direct Glare – as recommended by IESNA. Lighting power density shall not exceed 0.90 W/SQFT.

Typical linear fluorescents lamps shall be 28W T5 and typical ballasts shall be standard ballast factor, high power factor, low harmonic electronic ballasts. All areas with exterior windows shall include photocell controls exceptions for interior rooms with no daylighting. Typical 2x4 fixtures may include non-lens, specular reflectors, parabolic diffusers, or wall wash types.

The lighting for most public access areas with ACT ceiling shall be recessed, direct/indirect fluorescent fixtures. In the areas where the ceiling is open to structure, pendant mount direct/indirect fixtures shall be used. In the corridors where the ceiling is open to structure, indirect fixtures will be mounted in the roof trusses. In mechanical and storage areas, fixtures shall be fluorescent fixtures with standard lenses.

Parabolic troffers and semi-indirect fixtures are to be used throughout office typical space. Semi-direct fixtures to use steel housing.

Engine generating system shall produce 135 kW and include a four cycle diesel fueled engine, solid state controller, automatic transfer switch, tank with 55 hours of fuel, lead acid battery set, automatic float battery charger, and alarms. Exterior grade installations shall also include weather protected sound attenuated enclosure, and remote annunciator panel.

Fire alarm electrically supervised zone annunciated system, with supervised alarm initiation and alarm signaling circuits per NFPA 72. Recessed control panel enclosure.

Photovoltaic system shall be turn-key grid system of not less than 22 kW. The system shall include photovoltaic modules, inverter, mounting hardware, isolation transformer, disconnects, utility meter base, and multi-phase surge protective device. Photovoltaic modules shall be UL listed to UL standard 1703 and named on CEC list of approved systems for California. Installation shall be attractive, clean and orderly.

Refer to the latest San Diego Fire-Rescue Department Fire Station and Facilities Design and Construction Standards for additional detail.

7. Building Occupant and O&M Personnel Requirements

Prior to sign-off and acceptance of the facility, Final walk-thru with the Station Captain(s), Facilities Maintenance Officer, Logistics-Facilities staff will be provided and oral presentation and written instructions shall be provided as part of the O&M facility package.

O&M Expectations:

- Day-to-day HVAC operation: building occupants
- Periodic HVAC maintenance performed by: service company
- Lighting System maintenance will be performed by: owner's staff
- Training required for building occupants: demonstration and instruction documents
- Training required for building occupants: demonstration, classroom training, and instruction documents
- City Facilities Maintenance Staff.

8. LEED 2009 for New Construction and Major Renovations Scorecard

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LEED 2009 for New Construction and Major Renovations

Project Checklist

Sand Diego fire Station 17

######

Sustainable Sites — Possible Points: 26

Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
5			Credit 2	Development Density and Community Connectivity	5
		1	Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
3			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
2			Credit 4.4	Alternative Transportation—Parking Capacity	2
		1	Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	Credit 5.2	Site Development—Maximize Open Space	1
1			Credit 6.1	Stormwater Design—Quantity Control	1
1			Credit 6.2	Stormwater Design—Quality Control	1
1			Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
		1	Credit 8	Light Pollution Reduction	1

Water Efficiency — Possible Points: 10

Y	?	N			
Y			Prereq 1	Water Use Reduction—20% Reduction	
2		2	Credit 1	Water Efficient Landscaping	2 to 4
	2		Credit 2	Innovative Wastewater Technologies	2
	4		Credit 3	Water Use Reduction	2 to 4

Energy and Atmosphere — Possible Points: 35

Y	?	N			
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
12		7	Credit 1	Optimize Energy Performance	1 to 19
	7		Credit 2	On-Site Renewable Energy	1 to 7
		2	Credit 3	Enhanced Commissioning	2
		2	Credit 4	Enhanced Refrigerant Management	2
		3	Credit 5	Measurement and Verification	3
		2	Credit 6	Green Power	2

Materials and Resources — Possible Points: 14

Y	?	N			
Y			Prereq 1	Storage and Collection of Recyclables	
		3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			Credit 2	Construction Waste Management	1 to 2
		2	Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

Y	?	N			
2			Credit 4	Recycled Content	1 to 2
2			Credit 5	Regional Materials	1 to 2
	1		Credit 6	Rapidly Renewable Materials	1
		1	Credit 7	Certified Wood	1

Indoor Environmental Quality — Possible Points: 15

Y	?	N			
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
		1	Credit 1	Outdoor Air Delivery Monitoring	1
1			Credit 2	Increased Ventilation	1
	1		Credit 3.1	Construction IAQ Management Plan—During Construction	1
	1		Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
	1		Credit 5	Indoor Chemical and Pollutant Source Control	1
	1		Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
		1	Credit 7.2	Thermal Comfort—Verification	1
		1	Credit 8.1	Daylight and Views—Daylight	1
		1	Credit 8.2	Daylight and Views—Views	1

Innovation and Design Process — Possible Points: 6

	1		Credit 1.1	Innovation in Design: Specific Title	1
	1		Credit 1.2	Innovation in Design: Specific Title	1
	1		Credit 1.3	Innovation in Design: Specific Title	1
	1		Credit 1.4	Innovation in Design: Specific Title	1
	1		Credit 1.5	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1

Regional Priority Credits — Possible Points: 4

	1		Credit 1.1	Regional Priority: WEc2	1
	1		Credit 1.2	Regional Priority: WEc3	1
	1		Credit 1.3	Regional Priority: EAc2	1
		1	Credit 1.4	Regional Priority: IEQc8.1	1

50	26	34	**Total**	**Possible Points: 110**

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

APPENDIX H

SDG&E SERVICE CONNECTION

SDGE
A Sempra Energy utility™

Customer Copy

T.B. 1269-J4

Wanted Date: **ON APPLICATION** Service Type: **UG Service RFS** Customer Type: **Commercial** Date Prepared: **05/29/2013**

Project No: **252431**	Job No: **040**
Project Title: **CITY OF SD FIRE DEPT #3061 RFS:UG M&S**	
Project Address: **4206 CHAMOUNE AV**	
Project City: **SAN DIEGO**	Customer Phone #:
Contact: **ALAN BROWN**	Contact Phone #: **619-871-3478**

☐ Traffic Control Permit Required. Excavation/Encroachment Permits Required By

Service Attachment Point and/or Meter Location: **CUSTOMER TO CALL 800-411-7343 FOR REMOVAL OF SERVICE AND FOR SDGE CREW TO ACCESS BUILDING. SDGE CREW TO RFS MTR# 6451049 AND 100' OF #2 USA FROM 3313 HANDHOLE IN ALLEY.**

☒ SDG&E Application Required – Call: **1-800-411-7343**

Municipal Inspection Required By **N/A**

Meter height – 4'0" min. (3'0" min. for multiple meter installation) – 6'3" max. From finish grade to centerline of meter base. Meters are required to be readily accessible 24 hours per day. Meters must be located in a safe area free of any potentially hazardous or dangerous condition. Provide 3-ft. X 3-ft. Minimum clear and level working space in front of meter. Where meter room is proposed, contact the planner at the nearest SDG&E office.
Meter bases and meter service disconnects must be located at or immediately adjacent to each other and be identified with address and unit number it serves.

PROCEDURE FOR INSTALLATION

1. **PHONE DIG ALERT 1-800-227-2600 AT LEAST TWO DAYS PRIOR TO TRENCHING FOR LOCATION OF UNDERGROUND UTILITIES.**
2. Phone SDG&E at **619-699-1039** for the following:
   - 3 working days prior to trenching to arrange pre-meet with inspector and initiate trenching process.
   - After excavation of trench, installation of conduit and service entrance equipment at meter location, CALL FOR INSPECTION. Do not cover conduit without inspector's written approval to backfill.
   - When trench is backfilled and compacted, CALL FOR INSPECTION.
   - If service entrance equipment is installed after backfill, CALL FOR INSPECTION OF THE EQUIPMENT.
3. Meter cannot be set until inspector has approved installation, including service equipment, and receipt of city/county/state inspection clearance.

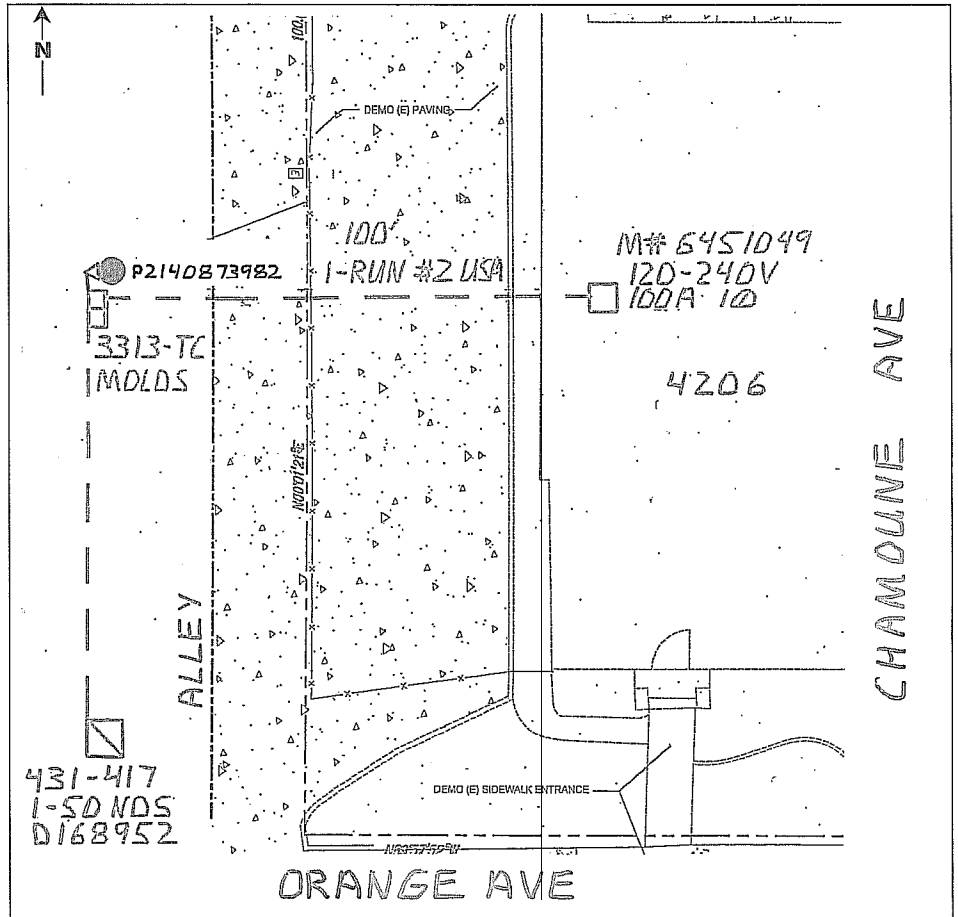
Power Source: **431-417**	Structure Number: **D168952**
Joint Trench with:	Handhole Installed by:
Standards Page #:	Handhole Lid Shall Read:

Ladder Arms:	Stop Trench: from pole	Riser Quad:
Bend Installed by:	Type:	
Conduit Installed by:	Conduit Size:	

Service Panel Rating: **100** Number/Size of Main Switch: **1@100** Voltage: **120/240**
# of Wires: **3** Phase: **Single** Utilities Maximum Contribution to Fault Current **42000** Amps

Metering: **Self-Contained** Meter Clips: **4**

Temp Service Charge Due on First Bill $



Additional Information: ☐ Right-of-way Required Assessor's Parcel Number:

Please call your Service Coordinator at 619-699-1039 with questions about application, inspection, construction installation and to schedule a crew.

If SDG&E encounters hazardous or toxic material while performing construction of your project, SDG&E will halt work immediately and it will be your responsibility to remove and/or clean up all hazardous or toxic material prior to SDG&E continuing construction. SDG&E shall have no liability or obligation whatsoever to clean up, remove or remediate any hazardous or toxic materials discovered during the course of construction unless it is through negligence of SDG&E.
Customer-owned facilities to receive electrical service are subject to all applicable local and state of California inspection authority requirements. Building address and/or meter base must be posted prior to meter set. Information on this sheet is void after six (6) months from date. Keep this notice with building permit.
All installations performed under this order must meet SDG&E standards unless a written deviation has been approved.

Planner: **MICHAEL WIESNER** Telephone: **858-637-7923**

SCOPE: THIS STANDARD SHOWS TYPICAL PLACEMENT OF UTILITIES WITHIN TRENCHES FOR DISTRIBUTION AND SERVICE IN DEDICATED R/W (STREET) AND PRIVATE PROPERTY, AND PROVIDES THE MINIMUM DEPTH AND CLEARANCE THAT MUST BE MAINTAINED BETWEEN VARIOUS UTILITIES OCCUPYING THE SAME TRENCH IN SAN DIEGO COUNTY.

PROPERTY SIDE

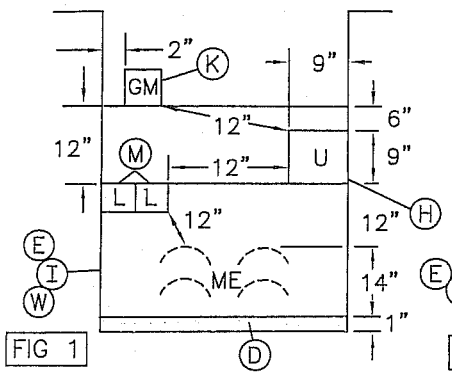


FIG 1

PROPERTY SIDE

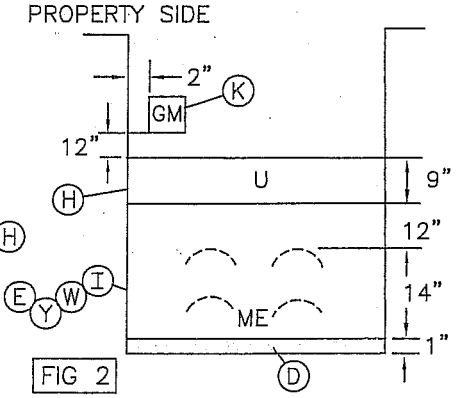


FIG 2

PROPERTY SIDE

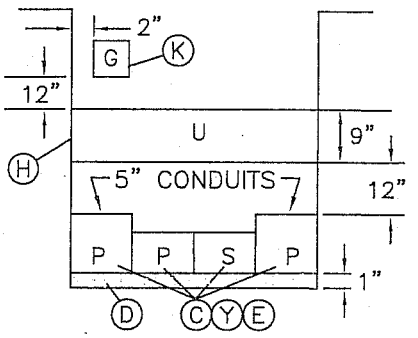


FIG 3 (SEE STANDARD 3376 FOR OTHER CONDUIT/TRENCH CONFIGURATIONS)

PROPERTY SIDE

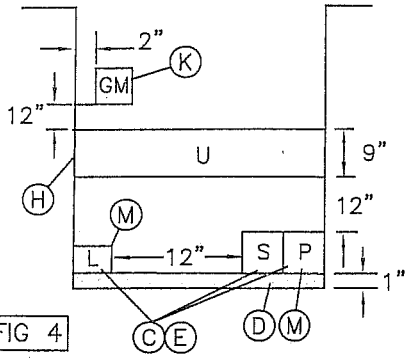


FIG 4

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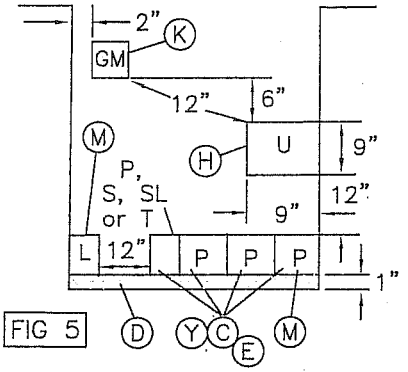

FIG 5

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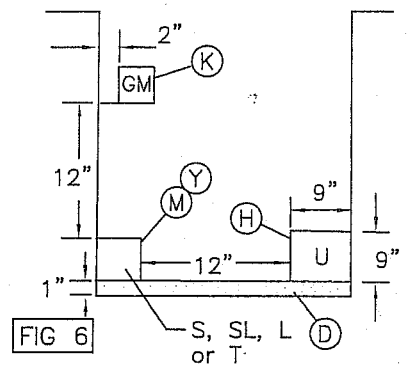


FIG 6

PROPERTY SIDE

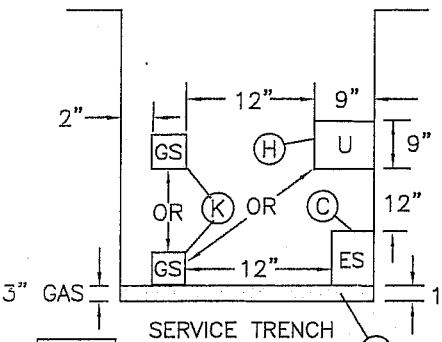


FIG 7

PROPERTY SIDE

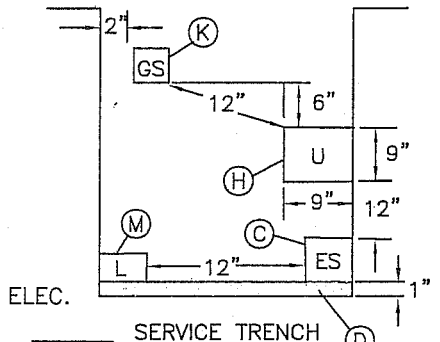


FIG 8

LEGEND	
GM	GAS MAIN
GS	GAS SERVICE
P	PRIMARY ELECTRIC
S	SECONDARY ELECTRIC
ES	ELECTRIC SERVICE
ME	MULTIPLE ELECTRIC (P OR S OR ES OR T, STACKED CONFIGURATION INCLUDING SPACERS AND 1-SACK CONCRETE SLURRY)
SL	SDG&E STREET LIGHT
L	FOREIGN UTILITY STREET LIGHT
U	FOREIGN UTILITY (TELCO, CATV)
T	SDG&E TELECOMMUNICATIONS

NOTES:

- DRAWINGS ARE NOT TO SCALE.
- SPACE ALLOTMENTS (OTHER THAN FOREIGN UTILITY) ARE 1/2 INCH LARGER THAN THE NOMINAL SIZE OF GAS MAIN, GAS SERVICE OR ELECTRIC CONDUIT. SEE INSTALLATION NOTE (H) FOR FOREIGN UTILITY SPACE ALLOTMENT.
- TYPICAL TRENCH SECTIONS ARE DESIGNED FOR INSTALLATIONS WHERE EACH OCCUPANT IS UTILIZING HIS ENTIRE SPACE ALLOTMENT. SIZE OF SPACE ALLOTMENTS MAY BE REDUCED OR ADDITIONAL ALLOTMENTS MAY BE ADDED PROVIDING MINIMUM COVER AND CLEARANCES ARE MAINTAINED AS LISTED ON PAGE 3370.2. ONLY ONE FOREIGN UTILITY SPACE ALLOTMENT FOR TELCO AND/OR CATV IS ALLOWED PER TRENCH. WIDTH AND DEPTH OF THE TRENCH MUST BE ADJUSTED ACCORDING TO SPACE ALLOTMENTS, MINIMUM CLEARANCES AND MINIMUM COVER.
- GAS PIPE REQUIRES A MINIMUM OF 12 INCHES RADIAL SEPARATION FROM ALL UTILITIES.

THE FOLLOWING CHARTS SHOW THE MINIMUM COVER FOR EACH UTILITY, THE MINIMUM SEPARATION BETWEEN SPACE ALLOTMENTS AND THE MAXIMUM SIZE FOR EACH SPACE ALLOTMENT. TO READ THE CHARTS, READ ACROSS AND DOWN UNTIL THE TWO JOIN IN A SQUARE, AND THAT IS THE DISTANCE REQUIRED BETWEEN THE TWO UTILITIES.

EXAMPLE

		VERTICAL			HORIZONTAL			
			ES		GS			
			↓		↓			
ES	ELECTRIC SERVICE	——	Ⓒ	——	12"			

UNDER VERTICAL, "ES" & "ES" JOIN AT Ⓒ WHICH REFERS TO INSTALLATION NOTE Ⓒ.

UNDER HORIZONTAL, "ES" & "GS" JOIN AT 12 INCHES WHICH WOULD BE THE DISTANCE REQUIRED FROM THE OUTER EDGE OF THE ELECTRIC SERVICE (SPACE ALLOTMENT) TO THE OUTER EDGE OF GAS SERVICE (SPACE ALLOTMENT).

MAIN TRENCH, [SERVICE TRENCH PUBLIC PROPERTY] (MINIMUM SEPARATION FROM)

		VERTICAL								HORIZONTAL									
		GM GS	P	S	ES	SL	ME	L	U	GM GS	P	S	ES	SL	ME	L	U	* MIN. COVER	FACILITY SPACE ALLOTMENT (MAX)
GM GS	GAS MAIN (D)(K)(N)(P) GAS SERVICE (O)(G)(U)(V)	—	12"	12"	12"	12"	12"	12"	Ⓗ	—	—	—	—	—	—	—	Ⓗ	30" MIN 42" MAX	4–/2"x4–1/2"
P	PRIMARY ELECTRIC (U)(V)(D)(M)(P)(W)	12"	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	–	12"	–	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	12"	–	30"	5–1/2"x5–1/2"
S	SECONDARY ELECTRIC (U)(V)(D)(P)(W)	12"	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	–	12"	–	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	12"	12"	30"	5–1/2"x5–1/2"
ES	ELECTRIC SERVICE (U)(V)(D)(P)(W)	12"	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	–	12"	–	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	12"	12"	30"	5–/2"x5–1/2"
SL	SDG&E STREET LIGHT (U)(V)(D)(L)(M)(P)(W)	12"	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	–	12"	–	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	12"	12"	30"	2–1/2"x2–1/2"
ME	MULTIPLE ELECTRIC (H)(W)(I)(R)(P)	12"	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	12"	12"	–	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	–	–	30"	18" x 14" (4 DUCTS)
L	FOREIGN UTILITY STREET LIGHT (U)(F)(M)(V)	12"	–	–	–	–	12"	–	12"	–	12"	12"	12"	12"	–	1" or less	12"	24"	2–1/2"x2–1/2"
U	FOREIGN UTILITY (TELCO, CATV) (F)(H)(J)(U)(V)	Ⓗ	12"	12"	12"	12"	12"	12"	–	Ⓗ	–	12"	12"	12"	–	12"	–	24"	9" x 24"
T	SDG&E TELECOMMUNICATIONS (C)(Y)	12"	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	–	12"	–	Ⓒ	Ⓒ	Ⓒ	Ⓒ	Ⓒ	12"	12"	30"	4–1/2"x4–1/2"

* ALL MINIMUM COVER DEPTHS MEASURED FROM FINAL GRADE. REDUCED DEPTHS IN NOTE Ⓑ ARE LESSER DEPTHS THAN WHAT IS SHOWN UNDER "MINIMUM COVER".

— NOT ALLOWED.

SERVICE TRENCH PRIVATE PROPERTY (MINIMUM SEPARATION FROM)

		VERTICAL					HORIZONTAL						
		GS	ES	ME	U	L	GS	ES	ME	U	L	*MIN. COVER	FACILITY SPACE ALLOTMENT (MAX)
GS	GAS SERVICE (U)(V)(D)(G)(K)(N)(O)(P)	–	12"	12"	–	12"	–	12"	–	12"	12"	24" MIN 42" MAX	2–1/2" x 2–1/2"
ES	ELECTRIC SERVICE (W)(U)(V)(D)(G)(P)	12"	Ⓒ	Ⓒ	12"	12"	12"	Ⓒ	Ⓒ	12"	12"	24"	5–1/2" x 5–1/2"
ME	MULTIPLE ELECTRIC (W)(I)(P)	12"	Ⓒ	Ⓒ	12"	12"	–	Ⓒ	Ⓒ	–	–	24"	WILL VARY DUE TO BOARD AMPACITY
U	FOREIGN UTILITY TELCO, CATV (U)(V)(F)(H)(J)	–	12"	6"	–	12"	12"	12"	–	–	12"	18"	9" x 9"
L	FOREIGN UTILITY STREET LIGHT (U)(V)(F)(M)	12"	12"	12"	12"	–	12"	12"	–	12"	1" or less	18"	2–1/2" x 2–1/2"

INSTALLATION:

A. AN EFFORT SHOULD BE MADE TO KEEP THE TRENCH DEPTH LESS THAN 60 INCHES. IF A PERSON IS REQUIRED TO ENTER A TRENCH 60 INCHES OR DEEPER, IT SHALL BE SHORED, BENCHED, OR SLOPED TO PREVENT MOVEMENT OF EARTH THAT MAY ENDANGER LIFE OR PROPERTY. THE TRENCH CONFIGURATION, UTILITY POSITIONING AND ALL OTHER RELATED CONSTRUCTION MUST CONFORM TO THIS STANDARD AND THE STATE OF CALIFORNIA PUBLIC UTILITIES COMMISSION GENERAL ORDERS 128 AND 112D, AND ANY OTHER APPROPRIATE GOVERNMENTAL AGENCY HAVING JURISDICTION OVER CONSTRUCTION.

NOTE: BENCHING THE TRENCH IS FOR SAFETY REASONS ONLY AND NOT TO BE USED FOR INSTALLATION PURPOSES.

(B) THE TRENCH DEPTH IN THIS STANDARD SHALL BE FOLLOWED FOR ALL NORMAL INSTALLATIONS. IN INSTALLATIONS WHERE THE TRENCH DEPTH CANNOT BE MET, G.O. 128 REQUIRES ONE OF THE FOLLOWING: (1) STEEL, OR (2) SCHEDULE 40 PVC OR SCHEDULE 80 PVC CONDUIT WITH A MINIMUM WALL THICKNESS OF 0.15 INCHES, OR (3) A 3 INCH LAYER OF CONCRETE (2 SACK 3/8" ROCK) ABOVE AND 2 INCHES ON EACH SIDE OF THE CONDUIT. REDUCED DEPTHS MUST BE APPROVED BY BOTH THE CUSTOMER PROJECT PLANNER AND SDG&E INSPECTOR.

(C) ANY CONDUIT COMBINATION SMALLER THAN 5 INCH, (NOT MULTIPLE ELECTRIC–ME OR SERVICE CONDUITS) ARE PERMITTED WITHOUT SEPARATION WHEN INSTALLED IN A HORIZONTAL CONFIGURATION. SDG&E TELECOMMUNICATIONS SPACE ALLOTMENT IS PERMITTED NEXT TO THE ELECTRIC SPACE ALLOTMENTS WITHOUT SEPARATION. (6 INCH MINIMUM TRENCH WIDTH, 24 INCH MAXIMUM TRENCH WIDTH) (SEE STANDARD 3376 FOR CONDUIT/TRENCH CONFIGURATION).

(D) BASE AND SHADING MATERIAL FOR GAS TRENCH ONLY:
IMPORTED MATERIAL CONSISTING OF NATURAL SAND OR MANUFACTURED SAND, EXISTING NATIVE MATERIAL, OR COMBINATIONS MAY BE USED FOR BASE AND SHADING MATERIAL PROVIDED IT COMPLIES WITH GAS STANDARD G7405 AND IS OF A QUALITY THAT WILL COMPLY WITH COMPACTION REQUIREMENTS OF GOVERNMENTAL AGENCIES. STANDARD G7405 SPECIFIES THAT THE MATERIAL MUST HAVE A MIXTURE OF PARTICLE SIZES ALL SMALLER THAN 1/2 INCHES. EXISTING NATIVE MATERIAL AND IMPORTED MATERIAL PROVIDED BY A DEVELOPER DOES NOT HAVE TO BE TESTED BY AN INDEPENDENT PROFESSIONAL TESTING FIRM IF, IN THE OPINION OF THE INSPECTOR, IT MEETS THE G7405 SPECIFICATION.

SHADING MATERIAL FOR ELECTRIC TRENCH ONLY: ELECTRIC SHADING MATERIAL (ESM) SPECIFICATION.
ACCEPTABLE MATERIAL FOR (DB) DIRECT BURIED CONDUITS.
NATURAL SAND, MANUFACTURED SAND, DECOMPOSED GRANITE, ROCK FREE SANDY LOAM, EXISTING NATIVE MATERIAL OR COMBINATION THEREOF. AGGREGATE COMPOSITION SHALL BE CAPABLE OF PASSING THROUGH A 1/2 INCH SIEVE. GRAVELS SHALL NOT AMOUNT TO MORE THAN 50% OF THE MIXTURE. SCREENING OR OTHER SUITABLE MEANS MAY BE REQUIRED AT THE DISCRETION OF THE SDG&E INSPECTOR TO MEET THIS (ESM) SHADING MATERIAL SPECIFICATION. NOT ACCEPTABLE ARE SOILS OF HIGHLY ORGANIC CONTENT IDENTIFIED BY ODOR OR SPONGY FEEL AND HIGHLY PLASTIC (SOGGY) CLAYS, SILTS OR METALLIC SLAG.

BASE AND SHADING MATERIAL FOR JOINT GAS AND ELECTRIC TRENCH:
WHEN BOTH GAS AND ELECTRIC ARE INSTALLED IN THE SAME TRENCH, THE BASE AND SHADING MATERIAL WHICH COMPLIES WITH GAS STANDARD G7405 SHALL BE USED FOR THE GAS PIPE. ELECTRIC SHADING MATERIAL (ESM) MAY BE USED FOR SHADING MATERIAL ON ELECTRIC CONDUIT.

BACKFILL MATERIAL FOR GAS AND/OR ELECTRIC:
THE MATERIAL USED FOR BACKFILLING THE TRENCH ABOVE THE SHADING MATERIAL AND EXTENDING UPWARD TO THE SUBGRADE SHALL BE FREE OF ROCKS OR CLODS LARGER THAN 6 INCHES IN ANY DIMENSION. THE COARSE MATERIAL SHALL BE WELL DISTRIBUTED THROUGHOUT THE FINER MATERIAL. THE AMOUNT OF ROCKS OR CLODS SHALL BE LIMITED, IN THE OPINION OF THE INSPECTOR, TO ALLOW FOR BAR TESTING FOR GAS LEAKS. THE BACKFILL MATERIAL SHALL MEET THE REQUIREMENTS OF ALL APPLICABLE CODES, ORDINANCES AND SDG&E STANDARDS AND BE FREE OF DEBRIS AND ORGANIC MATTER. 1–SACK CONCRETE SLURRY MIX MAY BE USED FOR FOR BACKFILL MATERIAL IF THE PIPE GAS IS SHADED WITH A MINIMUM OF 4 INCHES OF COMPACTED SHADING MATERIAL. 1–SACK CONCRETE SLURRY MIX IS PREFERRED FOR BACKFILL. THE SLURRY INSTALLATION SHALL MEET MEET THE REQUIREMENTS OF GOVERNMENTAL AGENCIES AND SDG&E STANDARDS.

BASE INSTALLATION FOR GAS:
FOR GAS, 3 INCHES OF BASE MATERIAL IS REQUIRED ON THE BOTTOM OF THE TRENCH TO PREVENT DAMAGE FROM ROCKS, SAGS, OR POCKETS.

EARTH TRENCH BOTTOM INSTALLATION FOR ELECTRIC: (EB & DB CONDUIT)
THE 1 INCH EARTH TRENCH BOTTOM SHALL BE STABLE WITH A UNIFORM GRADE CONTAINING NO HARD CLODS, ROCKS, ETC. THAT MAY DAMAGE THE CONDUIT. IF, IN THE OPINION OF THE SDG&E INSPECTOR, THE CONDUIT MAY BE DAMAGED, TAMPING, WETTING OR A 3 INCH BASE ELECTRIC SHADING MATERIAL (ESM) MAY BE REQUIRED.

SHADING INSTALLATION:
A MINIMUM COVER OF 4 INCHES OF COMPACTED SHADING MATERIAL (4 INCHES AFTER COMPACTION) SHALL BE REQUIRED ABOVE THE GAS PIPE AND ELECTRIC CONDUIT. A MINIMUM COVER OF 12 INCHES OF COMPACTED SHADING MATERIAL WILL BE REQUIRED IF, IN THE OPINION OF THE INSPECTOR, THERE IS AN EXCESSIVE AMOUNT OF ROCK AND CLODS IN THE BACKFILL. THE SHADING MATERIAL MUST BE INSTALLED AND COMPACTED AT EACH LEVEL BEFORE INSTALLING THE NEXT UTILITY. THE SHADING MATERIAL MUST BE INSTALLED BEFORE THE TRENCH IS BACKFILLED TO PREVENT DAMAGE FROM ROCKS, CLODS, ETC. GAS PIPE SHALL NEVER BE CONCRETE OR SLURRY ENCASED, AND SHALL HAVE THE PROPER BASE, SHADING, BACKFILL, AND COMPACTION.

COMPACTION:

EXTREME CARE SHALL BE TAKEN TO ENSURE THAT SHADING MATERIAL IS ADEQUATELY COMPACTED BOTH UNDERNEATH AND AROUND GAS PIPE AND FITTINGS TO PREVENT EXCESSIVE STRESS AND SHEARING FORCES. HAND TEMP AROUND FITTINGS WHERE MECHANICAL COMPACTION CANNOT BE USED. COMPACTING WITH A HYDRAHAMMER OR SIMILAR EQUIPMENT SHALL NOT BE ALLOWED ON TRENCHES WHERE POLYETHYLENE PIPE HAS BEEN INSTALLED. WHEN THE SHEEP'S FOOT METHOD OF COMPACTION IS USED, A MINIMUM OF 18" OF COVER IS REQUIRED BEFORE COMPACTING. WHEEL ROLLING WITH A HEAVY VEHICLE, COMBINED WITH ADEQUATE MECHANICAL COMPACTION, IF NEEDED, IS ALLOWED FOR COMPACTING BACKFILL MATERIAL PROVIDED A MINIMUM OF 4 INCHES OF MECHANICALLY COMPACTED SHADE MATERIAL AND A MINIMUM OF 12" OF BACKFILL MATERIAL EXISTS OVER THE GAS PIPE OR ELECTRICAL CONDUIT. WHEN FLOODING OF THE TRENCH IS DONE TO CONSOLIDATE BACKFILL, CARE MUST BE TAKEN TO ENSURE THAT GAS PIPE OR ELECTRIC CONDUIT HAS NOT FLOATED FROM ITS POSITION IN THE TRENCH. COMPACTION BY THE WATER JETTING METHOD IS NOT ALLOWED. ALLOWED. SHADING AND BACKFILL SHALL BE COMPACTED IN ACCORDANCE WITH GOVERNMENTAL AGENCIES AND SHALL HAVE A MINIMUM OF 90 PERCENT RELATIVE COMPACTION.

ALL BASE, SHADING, AND BACKFILL MATERIAL MUST BE APPROVED BY AN SDG&E INSPECTOR.

(E) ONE OR MORE 5 INCH PRIMARY CONDUITS SHALL BE SLURRY ENCASED.

(F) FOREIGN UTILITIES MUST NOT BE LOCATED UNDER ANY SDG&E FACILITIES, SUCH AS HANDHOLES, TRANSFORMER PADS, ETC.

(G) MINIMUM TRENCH WIDTH

UTILITY		PIPE/CONDUIT SIZE	MINIMUM WIDTH
GAS	SINGLE GAS – SERVICE	1 INCH AND LESS	6 INCHES
	SINGLE GAS	2 INCH	9 INCHES
	SINGLE GAS	3 AND 4 INCHES	12 INCHES
	SINGLE GAS	6 AND 8 INCHES	18 INCHES
ELECT. MAIN TRENCH	ALL CONDUIT SIZES INCLUDING 2 – 5 INCHES		
	ELECTRIC	ALL SIZES	6 INCHES
	JOINT UTILITIES	ALL PERMITTED SIZES (6 AND 8 INCH GAS)	12 INCHES 18 INCHES
	MULTIPLE ELECTRIC	SPACERS AND 1–SACK CONCRETE SLURRY	9 INCHES
ELECT. SERVICE TRENCH	SINGLE ELECT.	2 INCH CONDUIT	6 INCHES
	SINGLE ELECTRIC & FOREIGN UTILITIES (EXCLUDING GAS)	2 INCH CONDUIT	6 INCHES
	ELECTRIC	ALL SIZES	9 INCHES
	SINGLE ELECTRIC & FOREIGN UTILITIES (EXCLUDING GAS)	LARGER THAN 2 INCH	12 INCHES
	JOINT UTILITIES	ALL PERMITTED SIZES	12 INCHES
	MULTIPLE ELECTRIC	SPACERS AND 1–SACK CONCRETE SLURRY	9 INCHES

FOR A GAS OR ELECTRIC SERVICE, IF ANY OBSTRUCTION IS ENCOUNTERED (WATER PIPES, ETC.), A 2 FOOT WIDE X 3 FOOT LONG HOLE MAY BE REQUIRED FOR WORKING ROOM IN THE AREA OF THE OBSTRUCTION. THIS IS TO BE DETERMINED BY AN SDG&E INSPECTOR.

(H) THE FOREIGN UTILITY (U) SPACE ALLOTMENT MUST BE A MINIMUM OF 6 INCHES BELOW THE GAS MAIN AND 12 INCH RADIAL SEPARATION FROM ALL OTHER UTILITIES MUST BE MAINTAINED (SEE FIGURES 1 AND 5). IF (U) SPACE ALLOTMENT EXCEEDS A 9 INCH HORIZONTAL MEASUREMENT, IT MUST BE PLACED DIRECTLY ABOVE THE ELECTRIC SPACE ALLOTMENTS AND SHALL NOT EXTEND PAST THE OUTER SIDES OF ELECTRIC SPACE ALLOTMENTS. (FOR INSTALLATION PURPOSES, BENCHING THE TRENCH IS NOT ALLOWED), SEE FIGURES 2, 3, & 4. IF (U) SPACE ALLOTMENT IS 9" X 9" OR SMALLER, IT IS ALLOWED AT THE SAME LEVEL AS THE ELECTRIC (SEE FIGURE 6).

(I) ALL EB CONDUIT, REGARDLESS OF THE SIZE, SHALL BE CONCRETE ENCASED WITH 1–SACK CEMENT SLURRY. DB CONDUIT MAY ALSO BE SLURRY ENCASED IF INCLUDED IN THE MULTIPLE ELECTRIC PACKAGE. IN A SERVICE TRENCH, ALL EB CONDUIT SHALL BE ENCASED WITH CEMENT SLURRY (1 SACK). DB CONDUIT MAY ALSO BE CONCRETE OR SLURRY ENCASED IF INCLUDED IN THE MULTIPLE ELECTRIC PACKAGE.

(J) MINIMUM SEPARATION MAIN TRENCH

UTILITY	HORIZONTAL SEPARATION
TELCO MULTIPLE CONCRETE DUCT (CONDEX), TRANSITE, WATER, SEWER, FUEL, OIL, DIESEL, PROPANE GAS, SPRINKLER, DRAIN, LEACH LINES, STEEL GAS MAIN LARGER THAN 2", PRIVATELY OWNED UTILITIES i.e. PRIVATE TELCO, VIDEO, AUDIO, SECURITY WIRES, FIRE ALARM, STREET LIGHTING, ETC..	NOT PERMITTED IN JOINT TRENCH WITH GAS AND/OR ELECTRIC
WATER, SEWER, EXISTING GAS OR ELECTRIC, STORM DRAINS, STEAM, IRRIGATION PIPE, SPRINKLER PIPE LARGER THAN 4", PRIVATE TELCO TRANSITE, PROPANE GAS	* 5 FEET WITH 3 FEET OF UNDISTURBED SOIL
SEWAGE LEACH LINES OR SEEPAGE PITS	5 FEET FROM MAIN TRENCH FOR EACH 1' DEPTH OF MAIN TRENCH
IRRIGATION, SPRINKLER PIPE 4" AND LESS	* 3 FEET PROVIDED DEPTH OF PIPE DOES NOT EXCEED DEPTH OF GAS OR ELECTRIC
FUEL OIL, GASOLINE, DIESEL	FROM GAS—15 FEET, FROM ELECT.—5 FEET WITH 3 FEET OF UNDISTURBED SOIL

IN CONSIDERATION FOR THE SAFETY OF THE GENERAL PUBLIC, PERSONS ENGAGED IN CONSTRUCTION, PROPERTY, AND FOR THE OPERATION AND MAINTENANCE OF SDG&E SYSTEM, PROPANE GAS LINES ARE NOT PERMITTED IN A JOINT TRENCH WITH SDG&E FACILITIES.

* IF FIELD CONDITIONS WILL NOT PERMIT ANY OF THESE SEPARATIONS, THEN APPROVAL OF REDUCED SEPARATIONS MUST COME FROM BOTH THE CUSTOMER PROJECT PLANNER AND SDG&E INSPECTOR. ON FIELD CONDITIONS THAT WILL NOT PERMIT STANDARD PARALLEL SEPARATIONS, A 12 INCH MINIMUM SEPARATION IS REQUIRED. PROPANE GAS SHALL ALWAYS HAVE A 5 FOOT SEPARATION.

UTILITY	VERTICAL (CROSSING) SEPARATION MIN.
ALL WET UTILITIES, TELCO, TV, GAS, ELECT.	6 INCHES
FUEL OIL, GASOLINE, DIESEL	FROM GAS, 12 INCHES FROM ELECT. 6 INCHES
ARC—WELDABLE PIPELINES 3" AND LARGER	18 INCHES
STEAM (SEE NOTE)	FROM GAS, POLY PIPE 5 FEET FROM ELECT., 5 FEET

NOTE: PLACE INSULATING BARRIER BETWEEN STEAM MAIN AND POLYETHYLENE PIPE AND/OR ELECTRIC.

MINIMUM SEPARATION SERVICE TRENCH

IN A SERVICE TRENCH, WATER, SEWER, PROPANE GAS, SPRINKLER, DRAIN, LEACH LINES, PRIVATELY OWNED UTILITIES i.e., PRIVATE TELCO, VIDEO, AUDIO, SECURITY WIRES, FIRE ALARM, STREET LIGHTING, ETC., ARE NOT PERMITTED IN THE SAME TRENCH WITH GAS OR ELECTRIC. WHEN THESE FACILITIES PARALLEL GAS OR ELECTRIC, 12 INCHES SEPARATION BETWEEN SEPARATE TRENCHES SHALL BE MAINTAINED BETWEEN THE UTILITIES WITH AT LEAST 12 INCHES OF UNDISTURBED NATIVE SOIL BETWEEN TRENCHES. PROPANE GAS SHALL ALWAYS HAVE A 5 FOOT SEPARATION. WHEN CROSSING, A 6 INCH VERTICAL SEPARATION IS REQUIRED.

(EXCEPTION) WHEN THERE IS NO SDG&E GAS IN THE SERVICE TRENCH, A SINGLE NATURAL GAS LINE MAY BE INSTALLED IN THE TRENCH, PROVIDED A 12 INCH RADIAL SEPARATION IS MAINTAINED. (THIS IS FOR AN INDIVIDUAL HOUSE ON A CASE BY CASE BASIS, NOT A GROUP OF HOUSES/BUILDINGS).

FUEL OIL, GASOLINE, AND DIESEL LINES MUST MAINTAIN A 15 FOOT SEPARATION FROM GAS PIPELINES AND A FIVE FOOT SEPARATION WITH THREE FEET OF UNDISTURBED SOIL SEPARATION FROM ELECTRIC CONDUITS.

IF FIELD CONDITIONS WILL NOT PERMIT THESE SEPARATIONS, THEN APPROVAL OF REDUCED SEPARATIONS MUST COME FROM BOTH THE CUSTOMER PROJECT PLANNER AND SDG&E INSPECTOR.

WHEN FIELD CONDITIONS WILL NOT PERMIT STANDARD PARALLEL SEPARATIONS, A 12 INCH MINIMUM SEPARATION IS REQUIRED. PROPANE GAS SHALL ALWAYS HAVE A 5 FOOT SEPARATION.

(K) THE GAS MAIN SHALL BE THE LAST INSTALLED, SHALL BE ON THE PROPERTY SIDE OF THE TRENCH, AND SHALL HAVE A MINIMUM OF INCH PAD (AFTER COMPACTION) OF SHADING MATERIAL THE WIDTH OF THE TRENCH ABOVE ANY FOREIGN UTILITY. ANY CROSSING INVOLVING GAS SHALL MAINTAIN A MINIMUM VERTICAL SEPARATION OF 6 INCHES. A GAS SERVICE INSTALLED IN A MAIN TRENCH OR A SERVICE TRENCH ON PUBLIC PROPERTY SHALL REQUIRE THE SAME COVER AND CLEARANCES AS A GAS MAIN. A GAS SERVICE IN A TRENCH ON PRIVATE PROPERTY MAY BE INSTALLED ON THE SAME LEVEL AS FOREIGN UTILITY OR ELECTRIC, BUT SHALL NOT BE DEEPER THAN THE ELECTRIC SERVICE. SDG&E INSPECTOR IS TO DETERMINE AT WHICH LEVEL THE GAS SERVICE IS INSTALLED ON PRIVATE PROPERTY.

(L) SDG&E INSTALLED STREET LIGHT CIRCUITS, WHEN INSTALLED ALONE IN A TRENCH, SHALL BE AT A MINIMUM DEPTH OF 24 INCHES EVERYWHERE EXCEPT ON PRIVATE PROPERTY, WHERE THE MINIMUM MAY BE 18 INCHES BELOW FINAL GRADE.

(M) THE ELECTRIC PRIMARY WILL BE ON THE STREET SIDE OF THE TRENCH. THE SDG&E STREET LIGHT CIRCUITS WILL BE ON THE PROPERTY SIDE OF THE TRENCH WHENEVER POSSIBLE. FOREIGN UTILITY STREET LIGHTS (NOT SERIES) SHALL BE ON THE PROPERTY SIDE OF THE TRENCH AT THE SAME LEVEL AS SDG&E CONDUITS AND SHALL MAINTAIN A 12 INCH RADIAL SEPARATION. ALL UTILITIES SHALL MAINTAIN A 6 INCH SEPARATION WHEN CROSSING ALL SDG&E ELECTRIC. FOR SEPARATION ON THE SERVICE TRENCH, SEE CHART ON PAGE 7403.2 (3370.2).

(N) MINIMUM HORIZONTAL SEPARATION FROM GAS PIPE TO ANY FOREIGN SUBSTRUCTURE (VAULTS, HANDHOLES, ETC.) SHALL BE 12 INCHES.

(O) GAS LINES MUST NOT BE LOCATED UNDER ANY STRUCTURE, SUCH AS BUILDINGS, CARPORTS, PATIOS, BREEZEWAYS, EQUIPMENT PADS, AND FACILITIES, SUCH AS SPLICE BOXES FOR ELECTRIC, CATV, TELCO, ETC. TREES OR SHRUBBERY MUST NOT BE PLANTED OVER ANY GAS PIPELINE. A THREE FOOT SEPARATION MUST BE MAINTAINED BETWEEN THE TREE ROOT BALL AND THE GAS PIPELINE.

(P) IF AN AGENCY OR UTILITY SUCH AS THE U.S. GOVERNMENT, SAN DIEGO UNIFIED PORT DISTRICT, TELCO, CATV, ETC. REQUIRES CONCRETE ENCASEMENT, CONCRETE MAY BE SUBSTITUTED FOR THE BACKFILL. BASE & SHADING SHALL BE PER SDG&E STANDARDS. ON SDG&E CONDUITS, EITHER DIRECT BURIED OR CONCRETE ENCASED, A MINIMUM INCH COMPACTED SHADING MATERIAL SHALL BE INSTALLED OVER THE UPPERMOST DB CONDUITS BEFORE THE CONCRETE BACKFILL IS INSTALLED. ALL OTHER INSTALLATIONS SHALL PROVIDE THE REQUIRED MATERIALS AS SPECIFIED IN THIS STANDARD AND STANDARDS 3365 & 3376. NOTE: THE GAS MAIN, GAS SERVICE SHALL NEVER BE CONCRETE OR SLURRY ENCASED AND SHALL HAVE THE PROPER BASE, SHADING, BACKFILL, AND COMPACTION.

Q. MINIMUM SEPARATION OF ANY FOREIGN UTILITY INCLUDING WATER PIPES, SEWER, ETC., FROM SDG&E SUBSTRUCTURES SHALL BE 12 INCHES. PROPANE GAS SHALL BE 5 FEET.

REFERENCE:

(R) SEE STANDARD PAGE 3364.1 FOR UTILITY LOCATIONS IN LOCAL AND COLLECTOR STREETS.

S. SEE STANDARD PAGE 3364.2 FOR UTILITY LOCATIONS IN MAJOR STREETS, PRIME ARTERIALS AND EXPRESSWAYS.

T. SEE STANDARD PAGE 3364.3 FOR JOINT TRENCH TYPICAL LOCATION FOR UNDERGROUND CONVERSIONS.

(U) SEE STANDARD PAGE 3365 FOR IMPORTED OR NATIVE BACKFILL MATERIAL.

(V) SEE STANDARD PAGE 3365 FOR SLURRY BACKFILL MATERIAL.

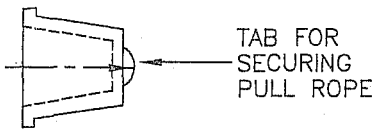
(W) CONCRETE OR CONCRETE SLURRY ENCASEMENT OF ELECTRIC CONDUITS SHALL BE IN ACCORDANCE WITH STANDARD 3376.

X. SEE STANDARD PAGE 3376, 3421, 3425, 3426, AND 3427 FOR CONDUIT CONFIGURATIONS ALLOWED IN THE SERVICE TRENCH.

(Y) SEE STANDARD 4620 TELECOMMUNICATIONS INSTALLATION.

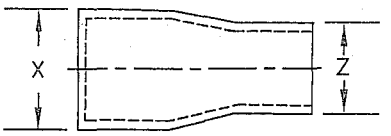
Z. FOR TRENCHING AND SHORING QUESTIONS, SEE SDG&E TRENCHING AND SHORING MANUAL.

CONDUIT PLUG



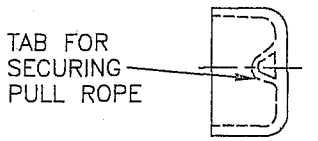
CONDUIT SIZE	STOCK NUMBER	ASSEMBLY UNITS
2"	544768	PLUG–2
3"	544800	PLUG–3
4"	544704	PLUG–4
5"	544736	PLUG–5

CONDUIT BELL REDUCER



CONDUIT SIZE X TO Z	STOCK NUMBER	ASSEMBLY UNITS
3"–2"	573376	RED3–2
4"–3"	573380	RED4–3
5"–4"	573384	RED5–4

CONDUIT END CAP

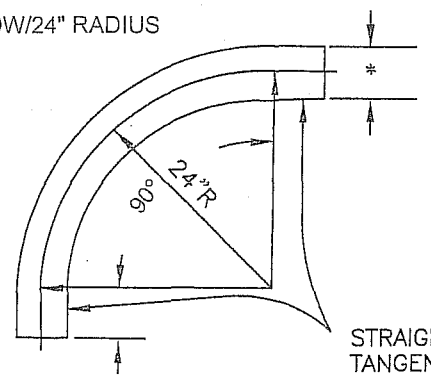


CONDUIT SIZE	STOCK NUMBER	ASSEMBLY UNITS
2"	203296	CAP–02
3"	203328	CAP–03
4"	203360	CAP–04
5"	203392	CAP–05

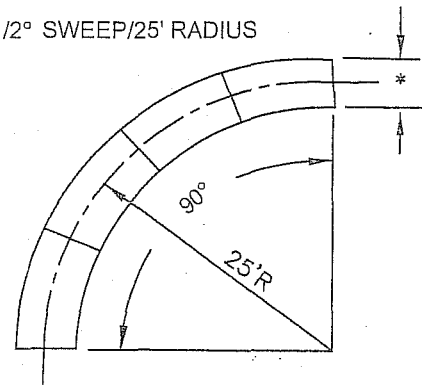
CONDUIT BENDS

(EXAMPLES)

90° ELBOW/24" RADIUS



22-1/2° SWEEP/25' RADIUS



BILL OF MATERIAL:

* NOMINAL CONDUIT SIZE	DEGREE OF CURVATURE	RADIUS OF CURVATURE	TYPE OF CONDUIT	STOCK NUMBER	ASSEMBLY UNITS		
					CONCRETE ENCASE	PRIMARY	SEC/SERV
2"	22-1/2°	25'–0"	DB 60	321808	1EB2–S	1DB2PS	1DB2SS
	45°	24"(SECONDARY ONLY)	DB 60	321920	–	–	1DB2S8
	45°	36"	DB 60	321810	1EB2–8	1DB2–8	–
	90°	24"(SECONDARY ONLY)	DB 60	321984	–	–	1DB2SB
	90°	36"	DB 60	321812	1EB2–B	1DB2–B	–
3"	11-1/4°	25'–0"	DB 60	321876	1EB3–C	1DB3–C	1DB3SC
	22-1/2°	25'–0"	DB 60	322144	1EB3–S	1DB3PS	1DB3SS
	45°	36"	DB 60	321878	1EB3–8	1DB3–8	1DB3S8
	90°	36"	DB 60	322048	1EB3–B	1DB3–B	1DB3SB
4"	11-1/4°	25'–0"	DB 100	321884	1EB4–C	1DB4–C	1DB4SC
	22-1/2°	25'–0"	DB 100	321826	1EB4–S	1DB4PS	1DB4SS
	45°	36"	DB 100	321942	1EB4–8	1DB4–8	1DB4S8
	90°	36"	DB 100	322082	1EB4–B	1DB4–B	1DB4SB
5"	11-1/4°	25'–0"	DB 60	321882	1EB5–C	1DB4–C	1DB5SC
	22-1/2°	25'–0"	DB 60	321856	1EB5–S	1DB5PS	1DB5SS
	45°	36"	DB 60	321960	1EB5–8	1DB5–8	1DB5S8
	90°	36"	DB 60	322112	1EB5–B	1DB5–B	1DB5SB

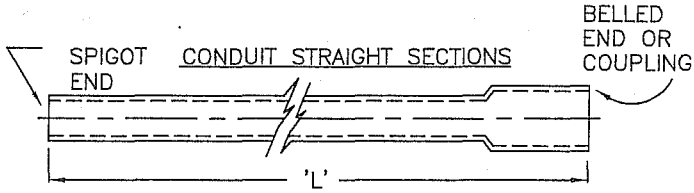
SCOPE: THIS STANDARD SHOWS THE CONDUIT AND FITTINGS USED TO CONSTRUCT UNDERGROUND CONDUIT SYSTEMS. CONDUIT AND FITTINGS IN THIS STANDARD SHALL BE USED IN BELOW-GROUND OR BRIDGE CELL APPLICATIONS.

NOTES:

(PVC) POLYVINYLCHLORIDE CONDUIT

- PVC CONDUIT SHALL BE GRAY OR BLACK IN COLOR. NO OTHER COLOR IS ACCEPTABLE FOR SDG&E CONDUIT SYSTEM.
- FOR SCHEDULE 40 AND SCHEDULE 80 ABOVE-GROUND COMPONENTS TO CONSTRUCT CABLE POLE RISERS, SEE UNDERGROUND STANDARD 4204.
- ALL 5" CONDUIT MUST BE ENCASED WITH CONCRETE SLURRY. (1-SACK MIX).
- DB CONDUIT IS REQUIRED FOR INSTALLATIONS REQUIRING DIRECT BURIED MATERIAL, i.e. SAND, DECOMPOSED GRANITE (DG), NATIVE, ETC.
- FOR DIRECT BURIED INSTALLATIONS, DB 60 IS REQUIRED FOR 2", 3" & 5" CONDUIT. DB 100 IS REQUIRED FOR 4" CONDUIT.
- ALL COUPLINGS, BENDS AND SWEEPS CLASSIFIED AS DB ARE TO BE USED WITH DB AND EB CONDUIT.
- DB = DIRECT BURIED CONDUIT.
- EB = ENCASED BURIED CONDUIT.
- THE SHELF LIFE FOR DB CONDUIT, BENDS, AND FITTINGS EXPOSED TO SUNLIGHT IS 6 MONTHS MAXIMUM. 2-#8 FROM A RISER POLE TO THE FIRST LOCATION SHALL BE INSTALLED IN 2" CONDUIT.

** - SCHEDULE 40 CONDUIT IS REQUIRED IN BRIDGE CELLS.



CONDUIT SIZE	TYPE	LENGTH 'L'	STOCK NUMBER	ASSEMBLY UNITS		
				1-SACK ENCASE W/SPACERS	PRIMARY	SEC/SERV
2"	DB 60	20'	249632	1EB2IN	1DB2-P	1DB2-S
3"	DB 60	20'	249664	1EB3IN	1DB3-P	1DB3-S
4"	DB 100	20'	249710	1EB4IN	1DB4-P	1DB4-S
5"	DB 60	20'	249728	1, 2DB5SL	-	1DB5-S
	** SCH40	10'	251408	-	S40-5"	S40-5"

(PE) POLYETHYLENE CONDUIT

CONDUIT SIZE	TYPE	COIL LENGTH	STOCK NUMBER	ASSEMBLY UNIT
1"	SDR 9	2000'	249630	1" PE
2"	SCH 40	2500'	252002	-
3"	SCH 40	1000'	252004	-
4"	SDR 15.5	500'	252006	-
5"	SCH 80	20' LENGTHS	252008	-

NOTES:

POLYETHYLENE CONDUIT SHALL BE BLACK OR BLACK WITH THREE EQUALLY SPACED RED STRIPS. NO OTHER COLOR IS ACCEPTABLE FOR THE SDG&E CONDUIT SYSTEM.

CORRUGATED POLYETHYLENE CONDUIT IS NOT ACCEPTABLE FOR THE SDG&E CONDUIT SYSTEM.

REFERENCE:

SEE STANDARD 3383 FOR SPLICING OR REPAIRING 1" POLYETHYLENE CONDUIT.

NOTES: ***

S/N 280384. SCH 40 PVC MAY BE USED AS A REPLACEMENT ON A TEMPORARY BASIS. (DEPENDS ON SUPPLIER OF COUPLING).

CONDUIT COUPLINGS

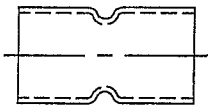
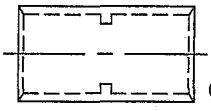
FIGURE A  DB SWEDGE COUPLING

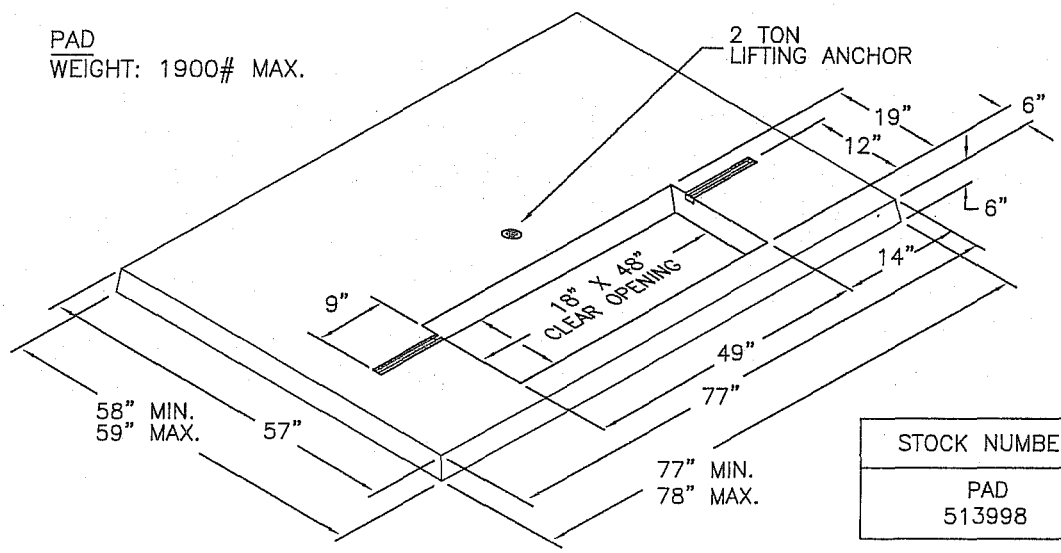
FIGURE B  DB MOLDING COUPLING (BOTH WITH CENTER STOPS)

FIGURES A & B	
COUPLING CONDUIT SIZE	DB OR EB STOCK NUMBER
2"***	279872
3"	279904
4"	279936
5"	280032

FIGURE C  DB STRAIGHT COUPLING (WITHOUT CENTER STOPS, TO BE USED ONLY WHEN REPAIRING EXISTING CONDUIT SYSTEMS)

FIGURE C	
COUPLING CONDUIT SIZE	DB OR EB STOCK NUMBER
2"	-
3"	279920
4"	279952
5"	280064

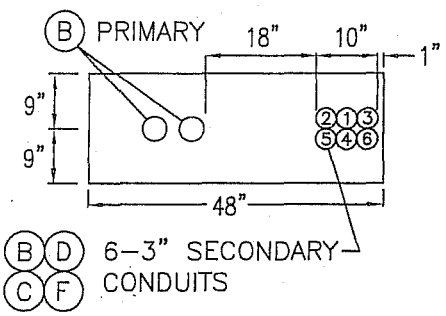
SCOPE: THIS STANDARD SHOWS REQUIREMENTS FOR INSTALLING A 3425 THREE-PHASE PAD FOR DEAD FRONT TRANSFORMER APPLICATION THROUGH 300 KVA. ALSO FOR 3750 KVA HHR DEAD FRONT BOOSTER TRANSFORMER AND PRIMARY METER CABINET.

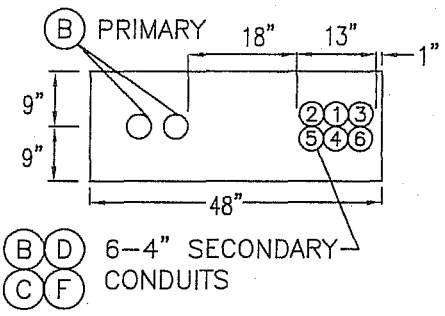


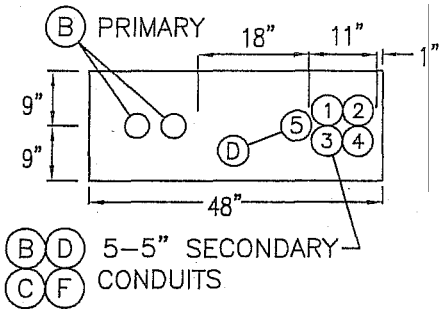
STOCK NUMBER	ASSEMBLY UNIT
PAD 513998	3425-3

MAXIMUM PRIMARY CONDUITS ALLOWED

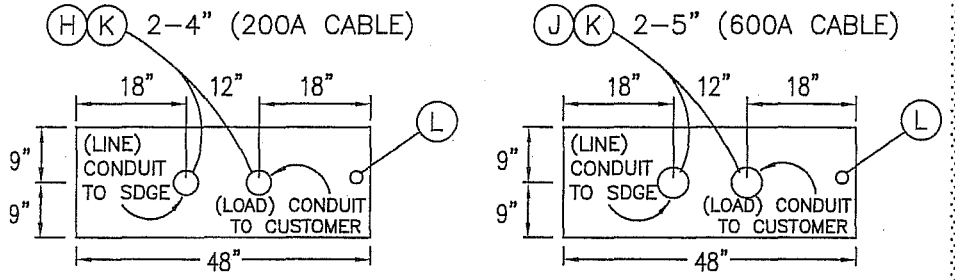
2 RUNS OF 4" (EB OR DB) PRIMARY CONDUIT







MAXIMUM PRIMARY CONDUITS ALLOWED FOR PRIMARY METER CABINET



STOCK NUMBER	DESCRIPTION	ASSEMBLY UNIT	MACRO UNIT
513998	PAD	3425-3	3425-M
162660	3311 HH	3311-S	

SERVICE GUIDE	X Indicates Latest Revision	Completely Revised	New Page	Information Removed

SDG&E ELECTRIC STANDARDS

REVISION
DATE 6-9-05
APPD MF / JJ

THREE-PHASE TRANSFORMER PAD INSTALLATION 3425

NOTES:

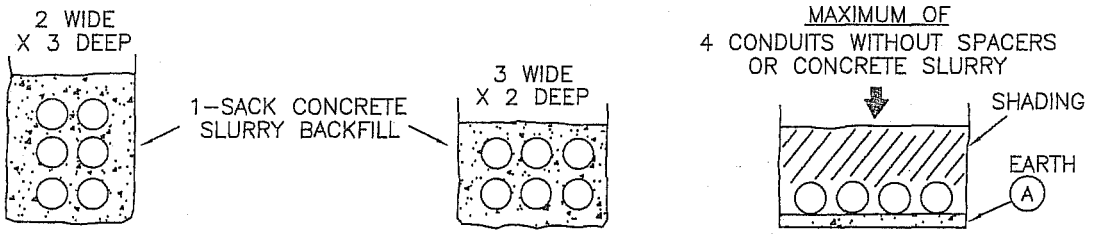
- TRANSFORMER COOLING FINS MAY OVERHANG REAR OF PAD BY 6 INCHES.
- IF NUMBER OF SECONDARY CONDUITS IS GREATER THAN MAXIMUM SHOWN, USE PAD PER STANDARD 3426 OR 3427.
- TRANSFORMER PAD MAY NOT BE POURED IN PLACE. USE PRECAST PADS ONLY.

INSTALLATION:

(A) 1 INCH EARTH IN THE BOTTOM OF THE TRENCH IS REQUIRED TO PREVENT DAMAGE FROM ROCKS, SAGS, AND POCKETS.

(B) PLACE ALL PRIMARY AND SECONDARY CONDUITS WITHIN THE PAD OPENING AS SHOWN ON PAGE 3425.1. TERMINATE PRIMARY AND SECONDARY CONDUITS FLUSH WITH THE TOP OF THE PAD. DO NOT CUT INTO THE CURVED PORTION OF THE ELBOWS. RADIUS OF CURVATURE IS 36" MINIMUM FOR 3 INCH, 4 INCH AND 5 INCH CONDUITS.

(C) THE CONDUIT CONFIGURATION REQUIREMENT BETWEEN TERMINATING POINTS LIMITS THE SECONDARY CONDUIT CONFIGURATION TO 2 WIDE X 3 DEEP OR 3 WIDE X 2 DEEP (NO ONE CONDUIT IS TO BE COMPLETELY SURROUNDED ON ALL FOUR SIDES BY OTHER CONDUITS), USING SPACERS AND 1 SACK CONCRETE SLURRY BACKFILL. CONDUITS MAY ALSO BE INSTALLED SIDE BY SIDE ON THE BOTTOM OF THE TRENCH WITHOUT SPACERS OR CONCRETE SLURRY (4 CONDUITS MAX.). IN THE TRANSITION AREA WHERE THE CONDUITS FROM THE BOTTOM OF THE TRENCH START TOWARD THE SURFACE (THE STRAIGHT PORTION BY THE 90° BEND), SPACERS MAY BE REQUIRED TO ALLOW THE 90° BENDS TO ENTER STRAIGHT INTO THE PAD OPENING. AT THE SURFACE POINT, THE CONDUITS MAY BE BUNDLED TOGETHER. USE SDG&E APPROVED BASE, SHADING AND BACKFILL.



(D) ANY COMBINATION OF 3, 4 OR 5 INCH SECONDARY CONDUITS MAY BE USED, PROVIDED THEY DO NOT EXCEED THE TOTAL OF 6 OR THE MAXIMUM OF EACH SIZE CONDUIT AS SPECIFIED ON PAGE 3425.1. AN EXCEPTION WOULD BE WHEN THE TRANSFORMER FEEDS ONE CUSTOMER WITH A 2000 AMP MAIN WHICH REQUIRES FIVE-5 INCH CONDUITS. NO FUTURE CUSTOMERS ARE ALLOWED IN THIS INSTALLATION. TWO EXTRA 1 INCH OR TWO EXTRA 2 INCH CONDUITS MAY BE ADDED TO SERVE STREET LIGHTS, RECREATION BUILDINGS, ETC.

(F) WHEN NUMBER OF REQUIRED CONDUITS IS LESS THAN THE TOTAL ALLOWABLE SHOWN ON PAGE 3425.1, INSTALL IN NUMBERED SEQUENCE AS SHOWN.

G. IN SOFT SOILS A CONCRETE BACKFILL (1-SACK MIX.) IS REQUIRED UNDER THE PAD, 12 INCHES BEYOND THE SIDE EDGES OF PAD AND 12 INCHES DEEP.

(H) MAXIMUM NUMBER OF CONDUITS ALLOWED FOR 200 AMP APPLICATION IS 2-4" PRIMARY CONDUITS. NO COMBINATION OF DIFFERENT SIZE PRIMARY CONDUITS ALLOWED. NO SECONDARY CONDUITS ALLOWED.

(J) MAXIMUM NUMBER OF CONDUITS ALLOWED FOR 600 AMP APPLICATION IS 2-5" PRIMARY CONDUITS. NO COMBINATION OF DIFFERENT SIZE PRIMARY CONDUITS ALLOWED. NO SECONDARY CONDUITS ALLOWED.

(K) PLACE PRIMARY CONDUITS WITHIN THE PAD OPENING AS SHOWN ON PAGE 3425.1. TERMINATE PRIMARY CONDUITS 3" ABOVE THE BOTTOM OF 3311 HANDHOLE. 3311 HANDHOLE TO BE INSTALLED WITH PRIMARY METER APPLICATIONS. SEE 4702.1 OR 4702.3. DO NOT CUT THE CURVED PORTION OF CONDUIT ELBOWS. RADIUS OF CURVATURE IS 36" MINIMUM FOR 4" OR 5" CONDUITS.

INSTALLATION CON'T:

(L) WHEN METER WILL NOT BE ATTACHED TO PRIMARY METER CABINET, INSTALL 1" CONDUIT TO REMOTE METER LOCATION. 1" CONDUIT NOT REQUIRED WHEN METER ATTACHED.

REFERENCE:

M. SEE STANDARD 3211 FOR PAD IDENTIFICATION.

N. SEE STANDARD 3370 OR 3371 FOR TRENCH, UTILITY POSITIONING, SHADING AND BACKFILL REQUIREMENTS.

O. SEE STANDARD 3376 FOR CONCRETE SLURRY.

P. SEE STANDARD 3481 FOR TRANSFORMER BARRIER PROTECTION.

Q. SEE STANDARD 3483 FOR MINIMUM OPERATING AND CLEARANCE REQUIREMENTS (PAD PLACEMENT).

R. SEE STANDARD 3484 FOR PAD INSTALLATION OF PAD-MOUNTED EQUIPMENT.

S. SEE STANDARD 3486 FOR RETAINING WALL REQUIREMENTS AND CLEARANCES FROM REVERSE SUBGRADE RETAINING WALLS.

T. SEE STANDARD 3487 FOR RETAINING WALLS.

U. SEE STANDARD 3751 FOR TRANSFORMER INSTALLATION.

V. SEE STANDARD 4512 FOR EQUIPMENT GROUNDING.

W. SEE STANDARD 4514 FOR GROUNDING TELCO CONDUCTOR IN PAD-MOUNTED EQUIPMENT.

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SCOPE: THIS STANDARD SHOWS THE (PREFERRED I) TRENCH GROUND WIRE INSTALLATION USED TO PROVIDE GROUNDING. THIS METHOD SHALL BE USED WHEN THE SAME PARTY IS RESPONSIBLE FOR THE CONDUIT AND PAD INSTALLATION AND WHEN A SYSTEM NEUTRAL FROM A SUBSTATION OR GROUNDING BANK IS PRESENT. USE ALTERNATE TRENCH GROUND WIRE METHOD PAGE 4510.2 WHEN A SYSTEM NEUTRAL IS NOT PRESENT. (G)

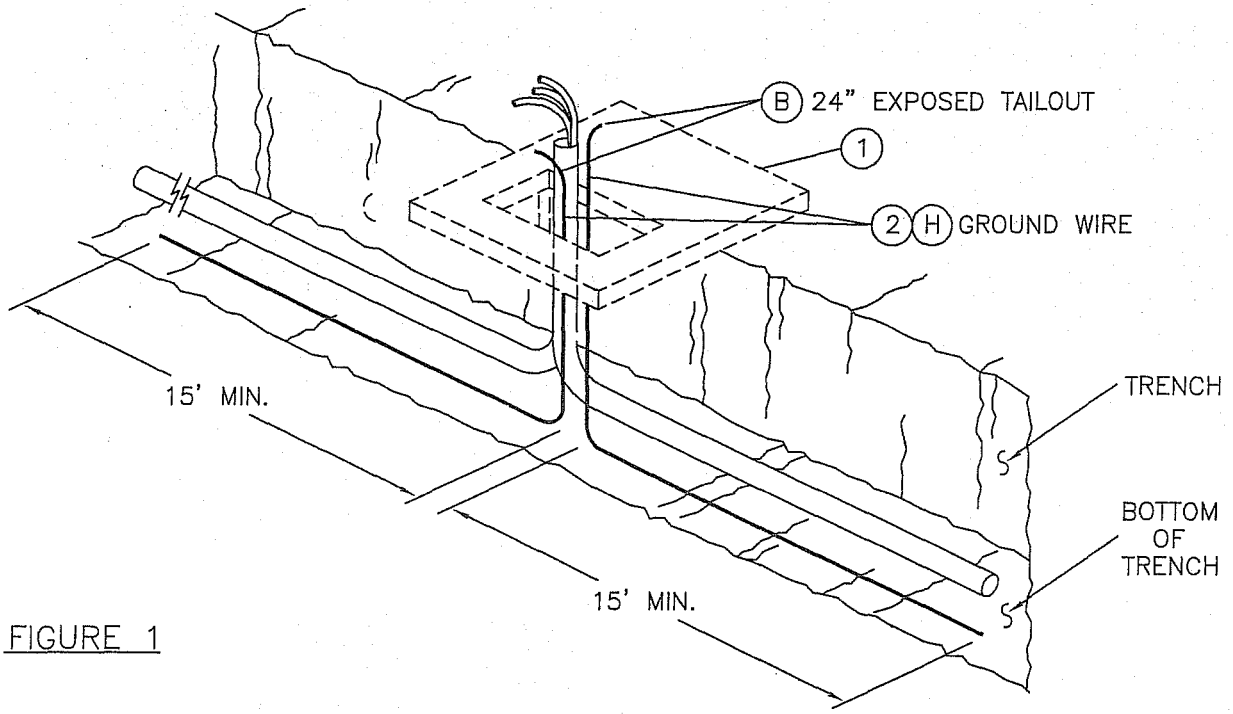
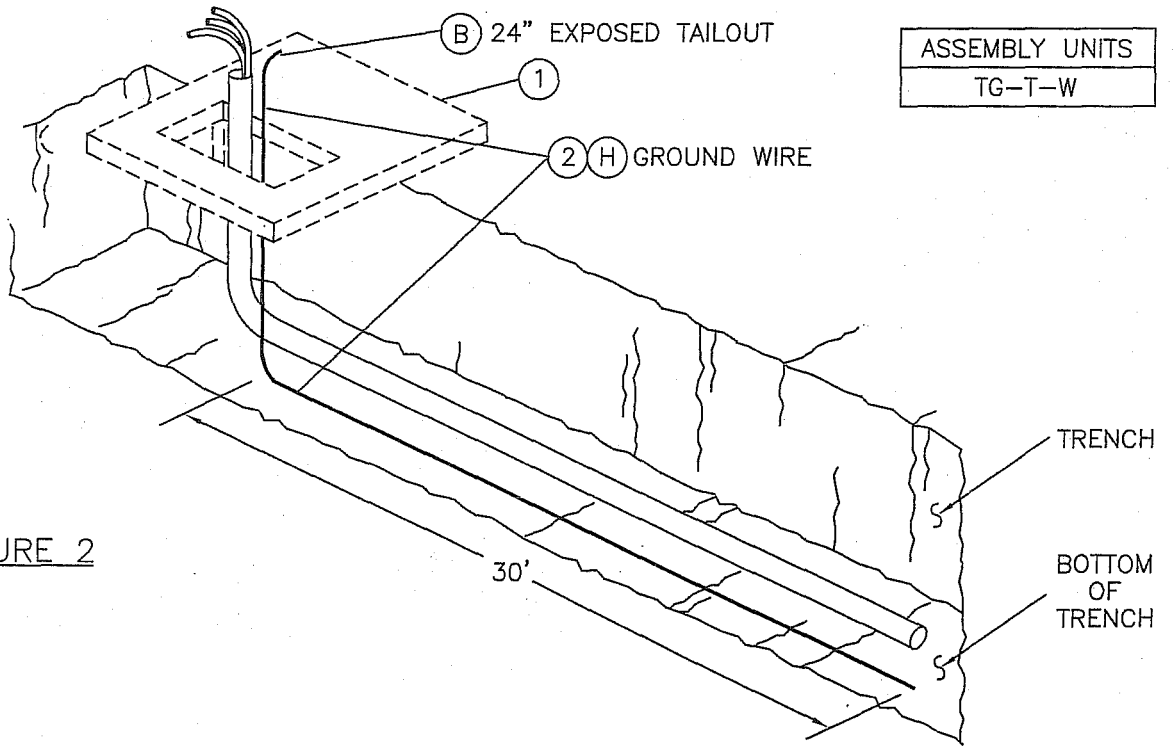


FIGURE 1



ASSEMBLY UNITS
TG-T-W

FIGURE 2

12 OF 25

SCOPE: THIS STANDARD SHOWS THE ALTERNATE TRENCH GROUND WIRE INSTALLATION USED TO PROVIDE GROUNDING. THIS METHOD SHALL BE USED WHEN THE SAME PARTY IS RESPONSIBLE FOR THE CONDUIT AND PAD INSTALLATION AND WHEN A SYSTEM NEUTRAL FROM A SUBSTATION OR GROUNDING BANK IS NOT PRESENT. USE PREFERRED GROUNDING METHOD ON PAGE 4510.1 WHEN A SYSTEM NEUTRAL IS PRESENT. (G)

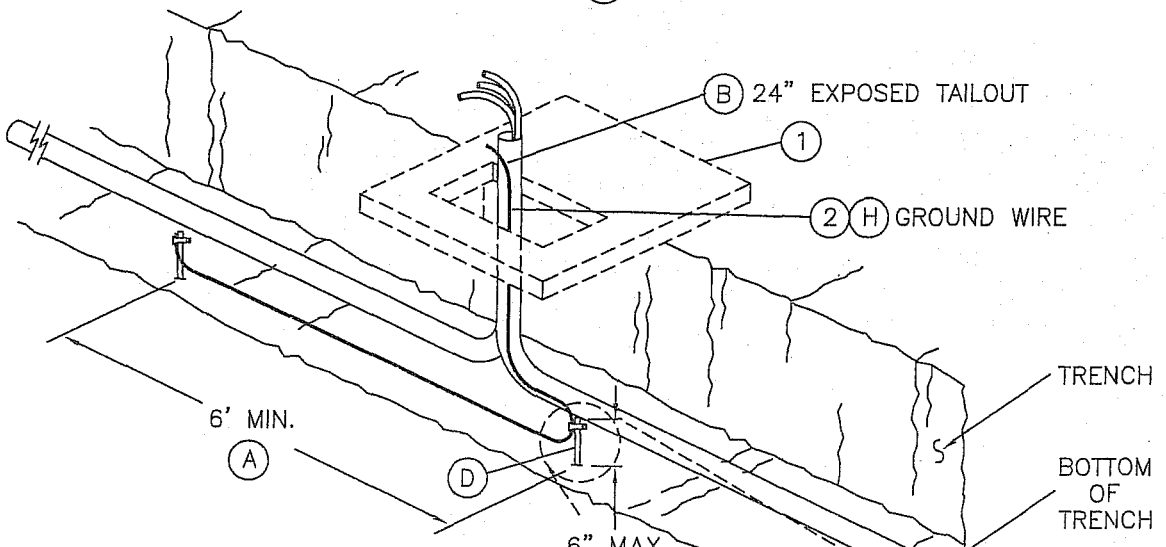


FIGURE 3

ASSEMBLY UNITS
TG–T–R

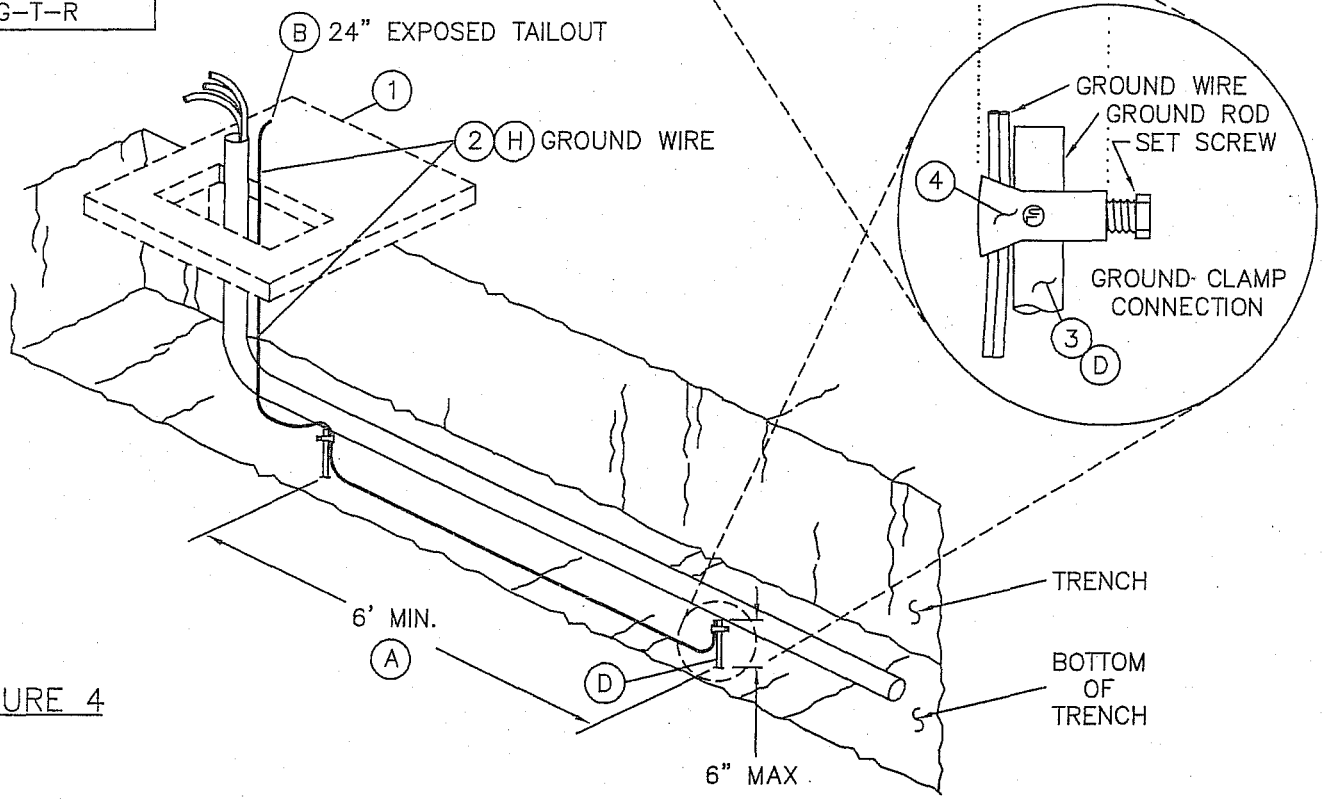


FIGURE 4

BILL OF MATERIAL:

ITEM	DESCRIPTION	QUANTITY	STOCK NUMBER	ASSEMBLY UNIT
1	PAD	1	REFER TO WORK ORDER	–
2	WIRE, BARE COPPER, #2, 7 STR. SOFT DRAWN	AS REQ'D	812816 (F)	GDWIRE
3	GROUND ROD, 5/8" X 8'–0", COPPERWELD	AS REQ'D	603072	–
4	GROUND ROD, CLAMP	AS REQ'D	230016	–

NOTES

CUSTOMERS SERVICE TRENCH:

– THE SERVICE TRENCH IS ON PRIVATE PROPERTY AND BELONGS TO THE CUSTOMER, THEREFORE, THE TRENCH GROUND WIRE SHOULD NOT BE INSTALLED IN THE CUSTOMER TRENCH. THE SITUATION IS DIFFERENT ON A RULE 16 JOB WHERE THE PAD–MOUNTED EQUIPMENT, PRIMARY/SECONDARY AND SERVICE TRENCH ARE ALL ON PRIVATE PROPERTY AND THE PAD AND CONDUIT BELONGS TO THE CUSTOMER AND REMAINS THE CUSTOMERS RESPONSIBILITY. IN THIS CASE, THE TRENCH GROUND WIRE COULD BE INSTALLED IN EITHER THE PRIMARY/SECONDARY OR THE SERVICE TRENCH.

INSTALLATION:

(A) GROUND RODS TO HAVE A 6 FOOT MINIMUM SEPARATION.

(B) LEAVE 24 INCHES OF WIRE (EXPOSED TAILOUT) ABOVE THE TOP OF FINAL GRADE.

C. USE EQUIPMENT GROUNDING INSTALLATION (PREFERRED II) ON STANDARD PAGE 4512.1 IF TRENCH GROUND WIRE WAS NOT INSTALLED PRIOR TO BACKFILLING THE TRENCH.

(D) LOCATE GROUND RODS SO THEY DO NOT TOUCH CONDUITS. GENERAL ORDER 128 REQUIRES GROUND RODS TO BE DRIVEN. THEY MAY BE DRIVEN AT AN ANGLE IF IT IS DIFFICULT IF NOT IMPOSSIBLE TO DRIVE STRAIGHT DOWN.

REFERENCE:

E. SEE STANDARD 3484.1 FOR PAD INSTALLATION OF PAD–MOUNTED EQUIPMENT.

(F) SEE STANDARD 4002.2 FOR WIRE INFORMATION.

(G) SEE STANDARD PAGE 4512.1 FOR (PREFERRED II) EQUIPMENT GROUNDING INSTALLATION WHEN DIFFERENT PARTIES ARE RESPONSIBLE FOR THE CONDUIT AND PAD INSTALLATION.

(H) SEE STANDARD 4512.2 FOR EQUIPMENT GROUNDING INSTALLATION.

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SERVICE GUIDE	Indicates Latest Revision	Completely Revised	New Page	Information Removed

REVISION DATE	SDG&E ELECTRIC STANDARDS	
APPD	TRENCH GROUND WIRE (PREFERRED I OR ALTERNATE)	4510.3

SDGE

A Sempra Energy utility

GAS STANDARD

UNDERGROUND DISTRIBUTION (UD) TRENCHES AND UTILITY POSITIONING	SDG&E: D7403

Purpose: **This Standard shows typical placement of utilities within trenches for distribution and service in dedicated R/W (street) and private property, and provides the minimum depth and clearance that must be maintained between various utilities occupying the same trench in San Diego County.**

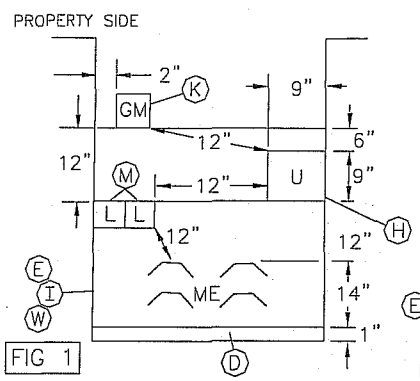

FIG 1

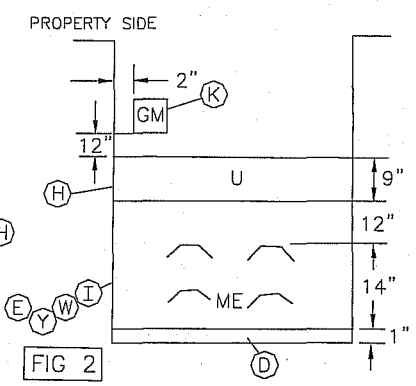

FIG 2

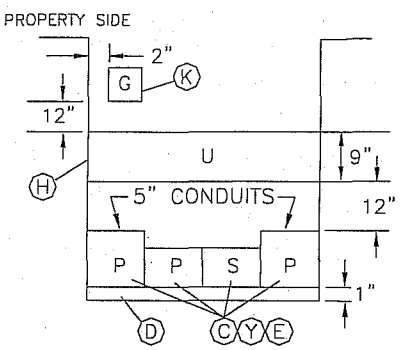

FIG 3 (SEE STANDARD 3376 FOR OTHER CONDUIT/TRENCH CONFIGURATIONS)

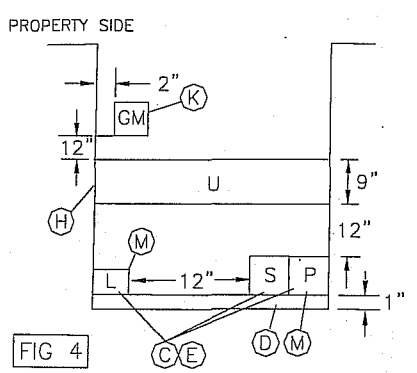

FIG 4

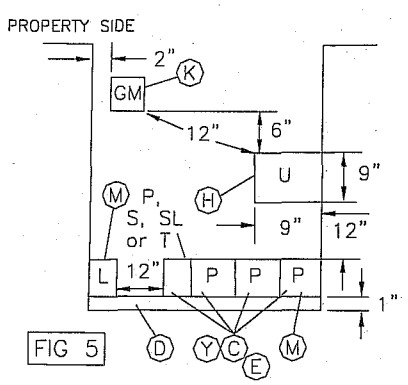

FIG 5

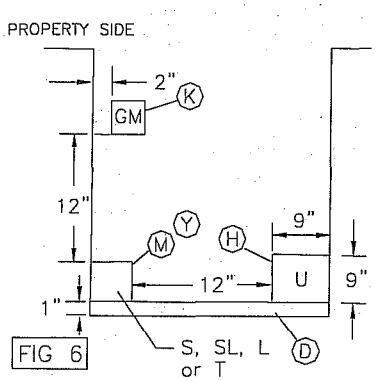

FIG 6

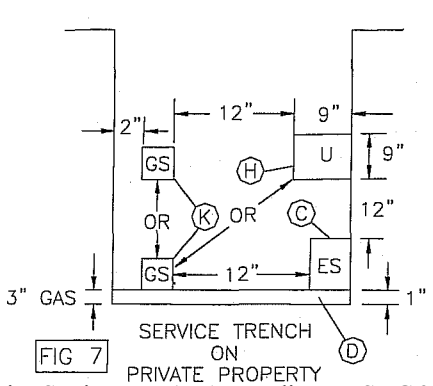

FIG 7

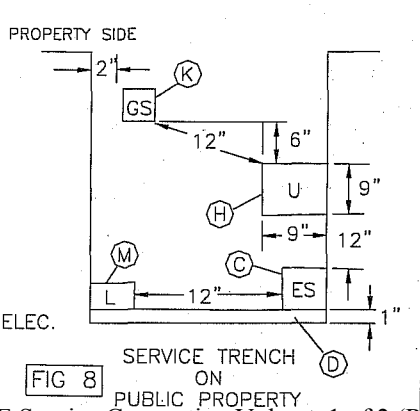

FIG 8

LEGEND	
GM	GAS MAIN
GS	GAS SERVICE
P	PRIMARY ELECTRIC
S	SECONDARY ELECTRIC
ES	ELECTRIC SERVICE
ME	MULTIPLE ELECTRIC (P OR S OR ES OR T, STACKED CONFIGURATION INCLUDING SPACERS AND 1–SACK CONCRETE SLURRY)
SL	SDG&E STREET LIGHT
L	FOREIGN UTILITY STREET LIGHT
U	FOREIGN UTILITY (TELCO, CATV)
	TELECOMMUNICATIONS

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UNDERGROUND DISTRIBUTION (UD) TRENCHES AND UTILITY POSITIONING	SDG&E: D7403

- Notes:
- Drawings are not to scale.
- Space allotments (other than foreign utility) are ½ inch larger than the nominal size of gas main, gas service or electric conduit. See installation note H for foreign utility space allotment.
- Typical trench sections are designed for installations where each occupant is utilizing his entire space allotment. Size of space allotments may be reduced or additional allotments may be added providing minimum cover and clearances are maintained as listed on page D7403.2. Only one foreign utility space allotment for Telco and/or CATV is allowed per trench. Width and depth of the trench must be adjusted according to space allotments, minimum clearances and minimum cover.
- Gas pipe requires a minimum of 12 inches radial separation from all utilities.
- The following charts show the minimum cover for each utility, the minimum separation between space allotments and the maximum size for each space allotment. To read the charts, read across and down until the two join in a square, and that is the distance required between the two utilities.
- Under Vertical, "ES" & "ES" join at C which refers to installation note C.
- Under Horizontal, "ES" & "GS" join at 12 inches which would be the distance required from the outer edge of the electric service (space allotment).

EXAMPLE

		VERTICAL			HORIZONTAL			
			ES		GS			
			↓		↓			
ES	ELECTRIC SERVICE	→	(C)		12"			

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SDGE

A Sempra Energy utility

GAS STANDARD

UNDERGROUND DISTRIBUTION (UD) TRENCHES AND UTILITY POSITIONING	SDG&E: D7403

UNDER VERTICAL, "ES" & "ES" JOIN AT ⓒ WHICH REFERS TO INSTALLATION NOTE ⓒ.

UNDER HORIZONTAL, "ES" & "GS" JOIN AT 12 INCHES WHICH WOULD BE THE DISTANCE REQUIRED FROM THE OUTER EDGE OF THE ELECTRIC SERVICE (SPACE ALLOTMENT) TO THE OUTER EDGE OF GAS SERVICE (SPACE ALLOTMENT).

MAIN TRENCH, SERVICE TRENCH PUBLIC PROPERTY (MINIMUM SEPARATION FROM)

		VERTICAL								HORIZONTAL									
		GM GS	P	S	ES	SL	ME	L	U	GM GS	P	S	ES	SL	ME	L	U	* MIN. COVER	FACILITY SPACE ALLOTMENT (MAX)
GM GS	GAS MAIN (D)(K)(N)(P) GAS SERVICE (O)(G)(U)(V)	–	12"	12"	12"	12"	12"	12"	Ⓗ	–	–	–	–	–	–	–	Ⓗ	30" MIN 42" MAX	4 1/2"x4 1/2"
P	PRIMARY ELECTRIC (U)(V)(D)(M)(P)(W)	12"	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	–	12"	–	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	12"	–	30"	5 1/2"x5 1/2"
S	SECONDARY ELECTRIC (U)(V)(D)(P)(W)	12"	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	–	12"	–	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	12"	12"	30"	5 1/2"x5 1/2"
ES	ELECTRIC SERVICE (U)(V)(D)(P)(W)	12"	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	–	12"	–	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	12"	12"	30"	5 1/2"x5 1/2"
SL	SDG&E STREET LIGHT (U)(V)(D)(L)(M)(P)(W)	12"	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	–	12"	–	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	12"	12"	30"	2 1/2"x2 1/2"
ME	MULTIPLE ELECTRIC (H)(W)(I)(R)(P)	12"	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	12"	12"	–	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	–	–	30"	18" x 14" (4 DUCTS)
L	FOREIGN UTILITY STREET LIGHT (U)(F)(M)(V)	12"	–	–	–	–	12"	–	12"	–	12"	12"	12"	12"	–	1" or less	12"	24"	2 1/2"x2 1/2"
U	FOREIGN UTILITY (TELCO, CATV) (F)(H)(J)(U)(V)	Ⓗ	12"	12"	12"	12"	12"	12"	–	Ⓗ	–	12"	12"	12"	–	12"	–	24"	9" x 24"
T	SDG&E TELECOMMUNICATIONS (C)(Y)	12"	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	–	12"	–	ⓒ	ⓒ	ⓒ	ⓒ	ⓒ	12"	12"	30"	4 1/2"x4 1/2"

* ALL MINIMUM COVER DEPTHS MEASURED FROM FINAL GRADE. REDUCED DEPTHS IN NOTE Ⓑ ARE LESSER DEPTHS THAN WHAT IS SHOWN UNDER "MINIMUM COVER".

– NOT ALLOWED.

SERVICE TRENCH PRIVATE PROPERTY (MINIMUM SEPARATION FROM)

		VERTICAL					HORIZONTAL						
		GS	ES	ME	U	L	GS	ES	ME	U	L	*MIN. COVER	FACILITY SPACE ALLOTMENT (MAX)
GS	GAS SERVICE (U)(V)(D)(G)(K)(N)(O)(P)	–	12"	12"	–	12"	–	12"	–	12"	12"	24" MIN 42" MAX	2 1/2" x 2 1/2"
ES	ELECTRIC SERVICE (W)(U)(V)(D)(G)(P)	12"	ⓒ	ⓒ	12"	12"	12"	ⓒ	ⓒ	12"	12"	24"	5 1/2" x 5 1/2"
ME	MULTIPLE ELECTRIC (W)(I)(P)	12"	ⓒ	ⓒ	12"	12"	–	ⓒ	ⓒ	–	–	24"	WILL VARY DUE TO BOARD AMPACITY – SEE STD 3376
U	FOREIGN UTILITY TELCO, CATV (U)(V)(F)(H)(J)	–	12"	6"	–	12"	12"	12"	–	–	12"	18"	9" x 9"
L	FOREIGN UTILITY STREET LIGHT (U)(V)(F)(M)	12"	12"	12"	12"	–	12"	12"	–	12"	or" less	18"	2 1/2" x 2 1/2"

INSTALLATION:

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UNDERGROUND DISTRIBUTION (UD) TRENCHES AND UTILITY POSITIONING	SDG&E: D7403

A. An effort should be made to keep the trench depth less than 60 inches. If a person is required to enter a trench 60 inches or deeper, it shall be shored, benched, or sloped to prevent movement of earth that may endanger life or property. The trench configuration, utility positioning and all other related construction must conform to this Standard and the State of California Public Utilities Commission General Orders 128 and 112-E, and any other appropriate governmental agency having jurisdiction over construction.

Note: Benching the trench is for safety reasons only and not to be used for installation purposes.

B. The trench depth in this standard shall be followed for all normal installations. In installations where the trench depth cannot be met, G.O. 128 requires one of the following: (1) steel, or (2) Schedule 40 PVC or Schedule 80 PVC conduit with a minimum wall thickness of 0.15 inches, or (3) a 3 inch layer of concrete (2 sack 3/8 inch rock) above and 2 inches of each side of the conduit. Reduced depths must be approved by both the customer project planner and SDG&E inspector.

C. Any conduit combination smaller than 5 inch, not multiple electric-ME or service conduits, are permitted without separation when installed in a horizontal configuration. SDG&E telecommunications space allotments are permitted next to the electric space allotments without separation. (6 inch minimum trench width, 24 inch maximum trench width). (See Underground Standard 3376 for conduit/trench configuration).

D. **Base and shading material for gas trench only**:

Imported material consisting of natural sand, manufactured sand, existing native material, or combinations may be used for base and shading material provided it complies with gas standard and is of a quality that will comply with compaction requirements of governmental agencies (permitting agencies). **MSP 26-10,** *Utility Trench Backfill – Base and Shading Material* specifies that the material must have a mixture of particle sizes all smaller than ½ inches. Existing native material and imported material provided by a developer does not have to be tested by an independent professional testing firm if, in the opinion of the inspector, it meets **MSP 26-10,** *Utility Trench Backfill – Base and Shading Material.*

Base and shading material for electric trench only: Electric shading material (ESM) specification. Acceptable material for (DB) direct buried conduits. Natural sand, manufactured sand, decomposed granite, rock free sandy loam, existing native material or combination thereof. Aggregate composition shall be capable of passing through a ½ inch sieve. Gravel shall not amount to more than 50% of the mixture. Screening or other suitable means may be required at the discretion of the SDG&E inspector to meet this (ESM) shading material specification. Not acceptable are soils of highly organic content identified by odor or spongy feel and highly plastic (soggy) clays, silts or metallic slag.

Base and shading material for joint gas and electric trench: When both gas and electric are installed in the same trench, the base and shading material which complies with **MSP 26-10,** *Utility Trench Backfill – Base and Shading Material* shall be used for the gas pipe. Electric shading material (ESM) may be used for shading material on electric conduit.

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Backfill material for gas and/or electric: The material used for backfilling the trench above the shading material and extending upward to the subgrade shall be free of rocks or clods larger than 6 inches in any dimension. The coarse material shall be well distributed throughout the finer material. The amount of rocks or clods shall be limited, in the opinion of the inspector, to allow for bar testing for gas leaks. The backfill material shall meet the requirements of all applicable codes, ordinances and SDG&E Gas Standards and be free of debris and organic matter. Concrete slurry mix may be used for backfill material if the gas pipe is shaded with a minimum of 4 inches of compacted shading material. Slurry installations shall meet the requirements of governmental agencies and SDG&E Gas Standards.

Base installation for gas:

Three inches of base material is required on the bottom of the trench to prevent damage from rocks, sags, or pockets.

Earth trench bottom installation for electric: (EB & DB conduit):

The 1 inch earth trench bottom shall be stable with a uniform grade containing no hard clods, rocks, etc, that may damage the conduit. If, in the opinion of the SDG&E inspector, the conduit may be damaged, tamping, wetting or a 3 inch base electric shading material (ESM) may be required.

Shading installation:

A minimum cover of 4 inches of compacted shading material (4 inches after compaction) shall be required above the gas pipe and electric conduit. There must be a minimum of 12" of un-compacted shading and backfill above the pipe and fittings prior to compacting. A minimum cover of 12 inches of compacted shading material will be required, if in the opinion of the inspector, there is an excessive amount of rock, and clods in the backfill. The shading material must be installed and compacted at each level before installing the next utility. The shading material must be installed before the trench is backfilled to prevent damage from rocks, clods, etc. Gas pipe shall never be concrete or slurry encased, and shall have the proper base, shading, backfill. and compaction.

Compaction:

Extreme care shall be taken to ensure that shading material is adequately compacted both underneath and around gas pipe and fittings to prevent excessive stress and shearing forces. Hand tamp around fittings where mechanical compaction cannot be used. Compacting with a hydrohammer or similar equipment shall not be allowed on trenches where polyethylene pipe has been installed. When the sheep's foot method of compaction is used, a minimum of 18 inches of cover is required before compacting. Wheel rolling with a heavy vehicle, combined with adequate mechanical compaction, if needed, is allowed for compacting backfill material provided a minimum of 4 inches of mechanically compacted shade material and a minimum of 12 inches of backfill material exist over the gas pipe or electrical conduit. When flooding of the trench is done to consolidate backfill, care must be taken to ensure that gas pipe or

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electric conduit is not floated from its position in the trench. Compaction by the water jetting method is allowed on TM. Shading and backfill shall be compacted in accordance with government permitting agencies and shall have minimum of 90 percent relative compaction.

All base, shading, and backfill material must be approved by an SDG&E inspector.

E. One or more 5 inch primary conduits shall be slurry encased.

F. Foreign utilities must not be located under any SDG&E facilities such as splice boxes. transformer pads, etc.

G. MINIMUM TRENCH WIDTH

	UTILITY	PIPE/CONDUIT SIZE	MINIMUM WIDTH (INCHES)
GAS	Single Gas - Service	1 inch and less	6
	Single Gas	2 inch	9
	Single Gas	3 and 4 inch	12
	Single Gas	6 and 8 inch	18
ELECTRIC MAIN TRENCH	ALL CONDUIT SIZES INCLUDING 2 - 5 INCHES		
	Electric	All sizes	6
	Joint utilities	All permitted sizes (6 & 8 inch gas)	12 18
	Multiple Electric	Spacer and 1 sack concrete slurry	9
ELECTRIC SERVICE TRENCH	Single Electric	2 inch conduit	6
	Single Electric & Foreign utilities (excluding gas)	2 inch conduit	6
	Electric	All sizes	9
	Single Electric & Foreign utilities (excluding gas)	Larger than 2 inch	12
	Joint utilities	All permitted sizes	12
	Multiple Electric	Spacer and 1 sack concrete slurry	9

For a gas or electric service, if any obstruction is encountered (water pipes. etc.), a 2 foot wide x 3 foot long hole may be required for working room in the area of the obstruction. This is to be determined by an SDG&E inspector.

H. The foreign utility (U) space allotment must be a minimum of 6 inches below the gas main and 12 inch radial separation from all other utilities must be maintained (See Figures 1 and 5). If (U) space allotment exceeds a 9 inch horizontal measurement, it must be placed directly above the electric space allotments and shall not extend past the outer sides of electric space allotments. For installation purposes, benching the trench is not allowed, See

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Figures 2, 3, & 4. If (U) space allotment is 9 inch x 9 inch or smaller it is allowed at the same level as the electric, (See Figure 6).

I. All EB conduit. regardless of the size. shall be concrete encased with 1 - sack cement slurry. DB conduit may also be slurry encased if included in the multiple electric package. In a service trench, all EB conduit shall be encased with cement slurry (1 sack).

One EB 5 inch or smaller conduit ("P", "S", "ES", or "SL") may occupy the same concrete envelope and be encased alongside multiple electric. Foreign utility street light shall not be concrete encased in the same envelope with SDG&E conduits.

MINIMUM SEPARATION MAIN TRENCH

UTILITY	HORIZONTAL SEPARATION
Telco multiple concrete duct (condex), transite, water, sewer, fuel, oil, diesel, propane gas, sprinkler, drain, leach lines, privately owned utilities i.e., Telco, video, audio, security wires, fire alarm etc., steel gas main larger than 2 inch, street lighting, etc.	Not permitted in joint trench with gas and/or electric
Water, sewer, existing gas or electric, storm drains, steam, irrigation pipe, sprinkler pipe larger than 4 inch, private Telco, transite, propane gas	*5 feet with 3 feet of undisturbed soil
Sewage leach lines or seepage pits	5 feet from main trench for each 1 foot depth of main trench
Irrigation, sprinkler pipe 4 inch and less	*3 feet provided depth of pipe does not Exceed depth of gas or electric
Fuel oil, gasoline. diesel	From gas 15 feet, from electric, 5 feet with 3 feet of undisturbed soil

In consideration for the safety of the general public and property, people engaged in construction and operation and maintenance activities of SDG&E gas systems, propane gas lines are not permitted in a joint trench with SDG&E facilities.

J. If field conditions will not permit any of these separations, then approval of reduced separations must come from both the customer project planner and SDG&E inspector. On field conditions that will not permit standard parallel separations, a 12 inch minimum separation is required. Propane gas shall always have a 5 foot separation.

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Utility	Vertical crossing minimum separation
All wet utilities, Telco, TV, gas, electric	6 inches
Fuel oil, gasoline, diesel	From gas, 12 inches From electric, 6 inches
Arc-weldable pipelines 3 inches and larger	18 inches
Steam (see note)	From gas, PE or steel pipe, 5 feet From electric, 5 feet

Note: Place insulating barrier between steam main and polyethylene pipe and/or electric. No insulating barrier needed for steel pipe.

MINIMUM SEPARATION SERVICE TRENCH

In a service trench, water, sewer, propane gas, sprinkler, drain, leach lines, privately owned utilities i.e., Telco, video, audio, security wires, fire alarm, street lighting, etc., are not permitted in the same trench with SDG&E gas or electric. When these facilities parallel gas or electric, 12 inches separation between separate trenches shall be maintained between the utilities with at least 12 inches of undisturbed native soil between trenches. Propane gas shall always have a 5 foot separation when crossing a 6 inch vertical separation is required.

(Exception), when there is no SDG&E gas in the service trench, a single natural gas line may be installed in the trench, provided a 12 inch radial separation is maintained. (This is for an individual house on a case by case basis, not a group of houses/buildings).

Fuel oil, gasoline, and diesel lines must maintain a 15 foot separation from gas pipelines and a five foot separation with three feet of undisturbed soil separation from electric conduits.

When field conditions will not permit standard parallel separations, a 12 inch minimum separation is required. Propane gas shall always have a 5 foot separation.

When there is no SDG&E gas in the service trench, a single natural gas line may be installed in the trench provided a 12 inch radial separation is maintained. (This is for an individual home on a case by case basis, not a group of homes).

K. The gas main shall be the last installed, shall be on the property side of the trench, and shall have a minimum of 6 inch pad (after compaction) of shading material the width of the trench above any foreign utility. Any crossing involving gas shall maintain a minimum vertical separation of 6 inches. A gas service installed in a main trench or a service trench on public

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property shall require the same cover and clearances as a gas main. A gas service in a trench on private property may be installed on the same level as foreign utility or electric, but shall not be deeper than the electric service. SDG&E inspector is to determine at which level the gas services are to be installed on private property.

L. SDG&E installed street light circuits, when installed alone in a trench, shall be at a minimum depth of 24 inches everywhere except on private property, where the minimum may be 18 inches below final grade.

M. The electric primary will be on the street side of the trench. The SDG&E street light circuits will be on the property side of the trench whenever possible. Foreign utility street lights (not series) shall be on the property side of the trench at the same level as SDG&E conduits and shall maintain a 12 inch radial separation and shall not be installed in SDG&E concrete encasement but may be placed directly above the encasement. All utilities shall maintain a 6 inch separation when crossing all SDG&E electric. For separation on the service trench, see page 2 & 3 of this Standard and Underground Standard page **3370.2**.

N. Minimum horizontal separation from gas pipe to any foreign substructure (vaults, handholes, etc.) shall be 12 inches.

O. Gas lines must not be located under any structure, such as buildings, carports, patios, breezeways, equipment pads, and facilities such as splice boxes for electric, CATV, Telco, etc. Trees or shrubbery must not be planted over any gas pipeline. A three foot separation must be maintained between the tree root ball and the gas pipeline.

P. If an agency or utility require concrete encasement, e.g., U.S. government, San Diego Unified Port District, Telco, CATV, etc., concrete may be substituted for the backfill. Base & shading shall be per SDG&E standards. On SDG&E conduits, either direct buried or concrete encased, a minimum 6 inch compacted shading material shall be installed over the uppermost DB conduits before the concrete backfill is installed. All other installations shall provide the required materials as specified in this Standard and **STANDARD G7409,** *Imported or Native Backfill.*

Note: The gas main or gas service shall never be concrete or slurry encased and shall have the proper base, shading, backfill. and compaction.

Q. Minimum horizontal separation of any foreign utility including water pipes, sewer etc., from SDG&E substructures shall be 12 inches, and propane gas shall be 5 feet.

R. For utility locations in local and collector streets, see **STANDARD D7425,** *Utility Locations in Local and Collector Streets in S.D. County* page 1.

S. For utility locations in major streets prime arterials and expressways, see **STANDARD D7425** page 2.

T. For joint trench typical location for underground conversions, see **STANDARD D7425** page 3.

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U. For imported or native backfill material, see **STANDARD G7409,** *Imported or Native Backfill.*

V. For slurry backfill material, see **STANDARD G7410,** *Slurry Backfill.*

W. Concrete or concrete slurry encasement of electric conduits shall be in accordance with Underground (U.G.) Standard 3376.

X. For conduit configurations allowed in the service trench, see U.G. Standards 3376, 3421, 3425, 3426, and 3427

Y. For telecommunications installation, see U.G. Standard 4620.

Z. For trenching and shoring, see SDG&E Trenching and Shoring Manual.

OPERATOR QUALIFICATION COVERED TASKS
(See **STANDARD G8113**, *Operator Qualification Program*, Appendix A, *Covered Task List*)

- **Task 1.2** - 49 CFR 192.327 – Maintaining minimum cover over pipelines

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SUMMARY OF DOCUMENT CHANGES & FILING INSTRUCTIONS	
Brief: Necessary revisions made to accurately reflect SDG&E Field procedures and organizational titles. This completed in compliance with the 5 year review process and transfer of this standard from GTS Miramar ownership. Operator Qualification covered tasks identified on page 10. The SDG&E contact person for this standard is Brett Peterson .	
Circulation Code	**Filing Instructions**
UGS	Page 3370
SGSD	Page 3370
GSSD	File Numerically
MSSD	File numerically behind the Excavation, Trenching, UG Structures tab.
ADSD	File numerically behind Excavation, Trenching, UG Structures – General tab
AISD	File numerically behind Excavation, Trenching, UG Structures – General tab
CFSD	File numerically behind the Excavation, Trenching, UG Structures - Distribution tab

DOCUMENT PROFILE SUMMARY NOTE: Do not make any changes to this table. Data in this table is automatically posted during publication.	
Document Number:	D7403
Document Title:	Underground Distribution (UD) Trenches and Utility Positioning
Contact Person:	Dan Meltzer
Current Revision Date:	8/19/2008
Last Full Review Completed On:	8/19/2008
Document Status:	Active
Document Type:	GAS
Category (FCD Only):	
If Merged, Merged to:	
Incoming Materials Inspection Required (MSP only):	
Company:	SDG&E
Common Document (if applicable:	
Contains OPQUAL Covered Task:	Yes
Part of SoCalGas O&M Plan (reviewed annually:	No
Part of SDG&E O&M Plan (reviewed annually:	No
O&M 49 CFR Codes & Impacted Sections of Document:	
Part of Transmission IMP (TIMP:	No
TIMP 49 CFR Codes & Impacted Sections:	
Part of Distribution IMP (DIMP):	No
Additional 49 CFR Codes) Covered by Document:	192.303, 192.319, 192.325, 192.327, 192.361
Learning Module (LM)Training Code:	

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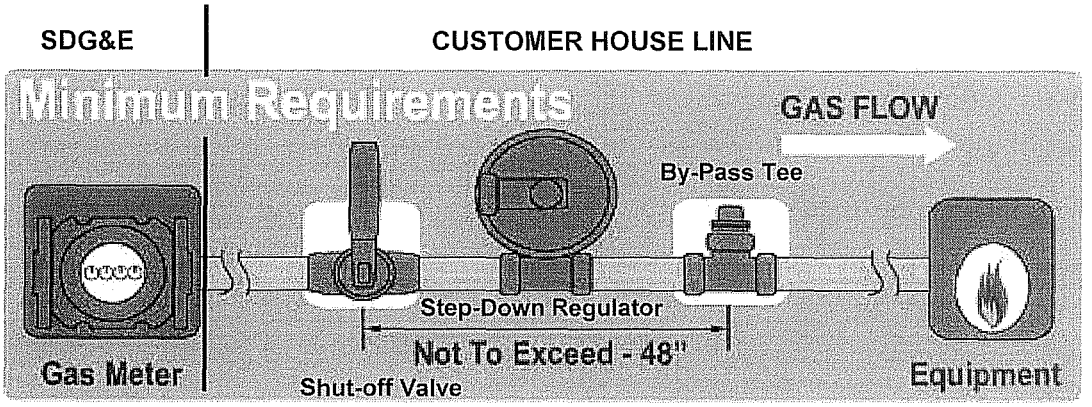
SDG&E
A Sempra Energy utility™

5 PSIG – New/Upgrade/Relocation/Meter Change
REQUEST FOR ELEVATED PRESSURE

SDG&E Project No.	252431-030 WO# 1006111
Project Name	CITY OF SD FIRE DEPT #3061
Project Address	4206 CHAMOUNE AV
Project City	SD TB: 1269 J4 MXW JAM4
Builder Name	
Builder Address	
Contact Person	
Contact Numbers	

Approval is based upon the builder complying with SDG&E Rule 2 requirements, receiving approval from SDG&E Gas Technical Services Region Engineering, via the gas load study, and complying with the acceptable locations for regulators, shut-off valves, manifolds, and pressure tap outlets as follows: (Builder's INITIALS REQUIRED in the boxes below.)

Initial Here	Builder shall install step-down regulator manifold in ventilated locations that have adequate room to work (3-foot clearance front and sides). Regulators must be reached safely from ground level or by use of a 6-foot ladder (3 to 8 feet from ground level). If the manifolds are installed in a parking garage, the area directly underneath shall be posted as a "No Parking Zone" to assure access.
Initial Here	Builder shall install a shut-off valve, step-down regulator and by-pass tee (to be used as a pressure tap) as per step-down regulator manifold diagram. Unions or flange fittings may be installed before and/or after the regulator to facilitate the removal and maintenance of the equipment.
Initial Here	Step-down regulators must be installed per the manufacturer's installation requirements. Regulator may be suitable for multi-position mounting when using a vent line. However, when using a vent-limiting device, the regulator must be mounted in a horizontal upright position.



My signature represents my understanding that failure to follow the step-down regulator and/or manifold installation specifications as listed above will result in one of the following actions by SDG&E: refusal to provide 5 PSIG, or provide 5 PSIG after receipt of Special Facility and Cost of Ownership payments

BUILDER: ALL FIELDS IN SHADED AREA BELOW ARE REQUIRED

Print Name		Title	
Signature		Date	
E-mail		Fax	
Phone		Cell	

Customer: When Completed Return Form to Planner: _____

FOR SDG&E USE ONLY: PRINT NAME & PHONE NUMBERS

Customer Project Planner		Phone:
CSF Supervisor		Phone
Site Visit Completed By CSF		Date:
Returned to Planner By:		Date:

SDGE
A Sempra Energy utility

Customer Copy

T.B. 1269-J4

Wanted Date: **ON INSPECTION** Service Type: **Gas Service New** Customer Type: **Commercial** Date Prepared: **05/30/2013**

Project No: **252431** Job No: **030**

Project Title: **CITY OF SD FIRE DEPT #3061 IN:GS SERV**

Project Address: **4206 CHAMOUNE AV**

Project City: **SAN DIEGO** Customer Phone #:

Contact: **ALAN BROWN** Contact Phone #: **619-871-3478**

☐ Traffic Control Plan Required

Excavation/Encroachment Permits Required By **Customer**

Service Installation and/or Meter Location: **Meter to be located outside of south wall. Install first houseline 48" East of SDGE Riser and 18 inches above final grade. Customer to provide all trench, excavation, 3' x 3' weldhole at 6" gas main in Orange Ave, backfill, compaction and surface repair from point of interception to new riser location. Please contact your Service Coordinator to schedule a construction pre-meet.**

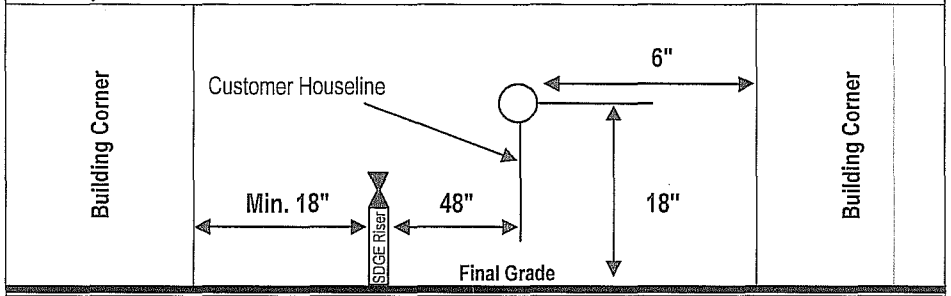
☒ SDG&E Application Required – Call: **1-800-411-7343**

Municipal Inspection Required By **City of San Diego**

Meters are required to be readily accessible 24 hours per day. Meters must be located in a safe area free of any potentially hazardous or dangerous condition. Provide 3-ft. X 3-ft. clear and level working space in front of meter. Meter must be located on premises to be served. **PHONE DIG ALERT 1-800-227-2600 AT LEAST TWO DAYS PRIOR TO TRENCHING FOR LOCATION OF UNDERGROUND UTILITIES.**

Barricade Required By: **N/A**

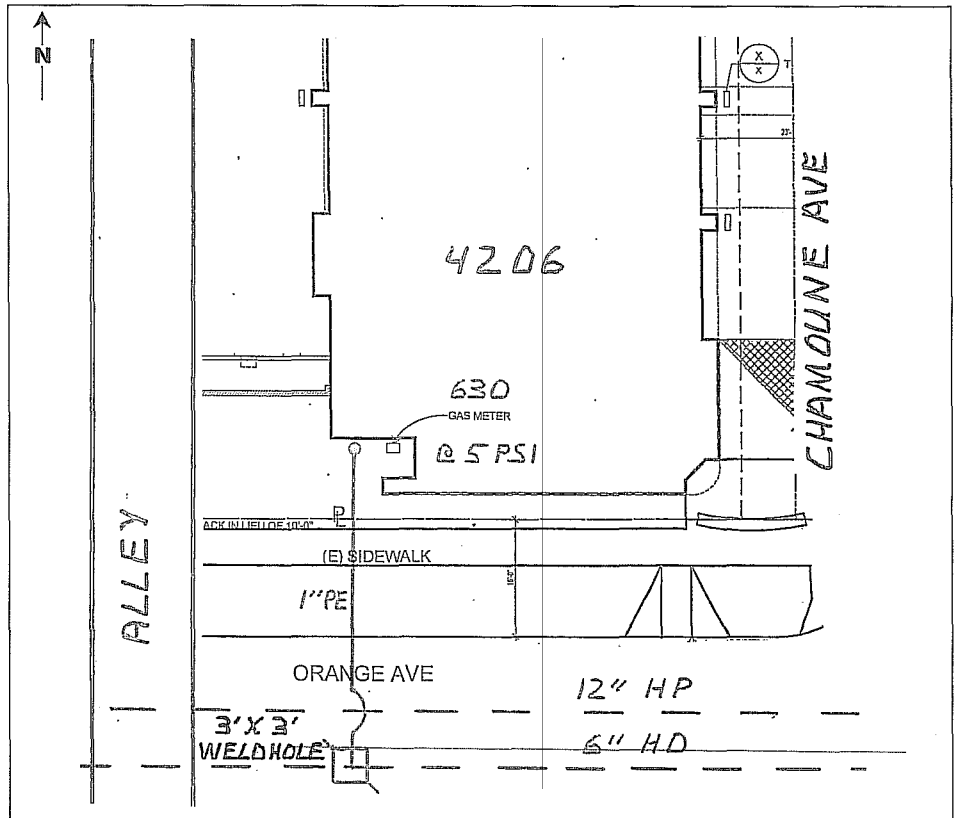
Trench By: **Customer** Joint Trench With:



If SDG&E encounters hazardous or toxic material while performing construction of your project, SDG&E will halt work immediately and it will be your responsibility to remove and/or clean up all hazardous or toxic material prior to SDG&E continuing construction. SDG&E shall have no liability or obligation whatsoever to clean up, remove or remediate any hazardous or toxic materials discovered during the course of construction unless it is through negligence of SDG&E.

Customer-owned facilities to receive gas service are subject to all applicable local and state of California inspection authority requirements. Building address and/or houseline must be permanently identified prior to meter set. Information on this sheet is void after six (6) months. Keep this notice with building permit.

All installations performed under this order must meet SDG&E standards unless a written deviation has been approved.



☐ Right-of-way Required

Assessor's Parcel Number:

Additional Information:
Please call your Service Coordinator at 619-699-1039 with questions about application, inspection, construction installation and to schedule a crew.

Meter Separation from Electric Panel: N/A

Planner: **MICHAEL WIESNER** Telephone: **858-637-7923**

SDGE
A Sempra Energy utility

GAS METER & SERVICE LOCATION

Customer Copy

T.B. 1269-J4

Wanted Date: **ON APPLICATION** Service Type: **Gas Service RFS** Customer Type: **Commercial** Date Prepared: **05/29/2013**

Project No: **252431** Job No: **020**

Project Title: **CITY OF SD FIRE DEPT #3061 RFS:GS M&S**

Project Address: **4206 CHAMOUNE AV**

Project City: **SAN DIEGO** Customer Phone #:

Contact: **ALAN BROWN** Contact Phone #: **619-871-3478**

☐ Traffic Control Plan Required

Excavation/Encroachment Permits Required By

Service Installation and/or Meter Location: **CUSTOMER TO CALL 800-411-7343 FOR REMOVAL OF SERVICE AND FOR SDGE CREW ACCESS. SDGE CREW TO RFS 250 CFH MTR# 1130135 AND 40' OF 1" PE AT MAIN IN ALLEY.**

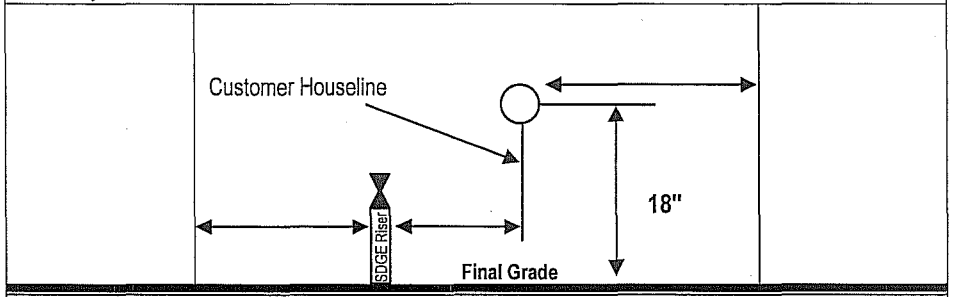
☒ SDG&E Application Required – Call: **1-800-411-7343**

Municipal Inspection Required By **N/A**

Meters are required to be readily accessible 24 hours per day. Meters must be located in a safe area free of any potentially hazardous or dangerous condition. Provide 3-ft. X 3-ft. clear and level working space in front of meter. Meter must be located on premises to be served. **PHONE DIG ALERT 1-800-227-2600 AT LEAST TWO DAYS PRIOR TO TRENCHING FOR LOCATION OF UNDERGROUND UTILITIES.**

Barricade Required By: **N/A**

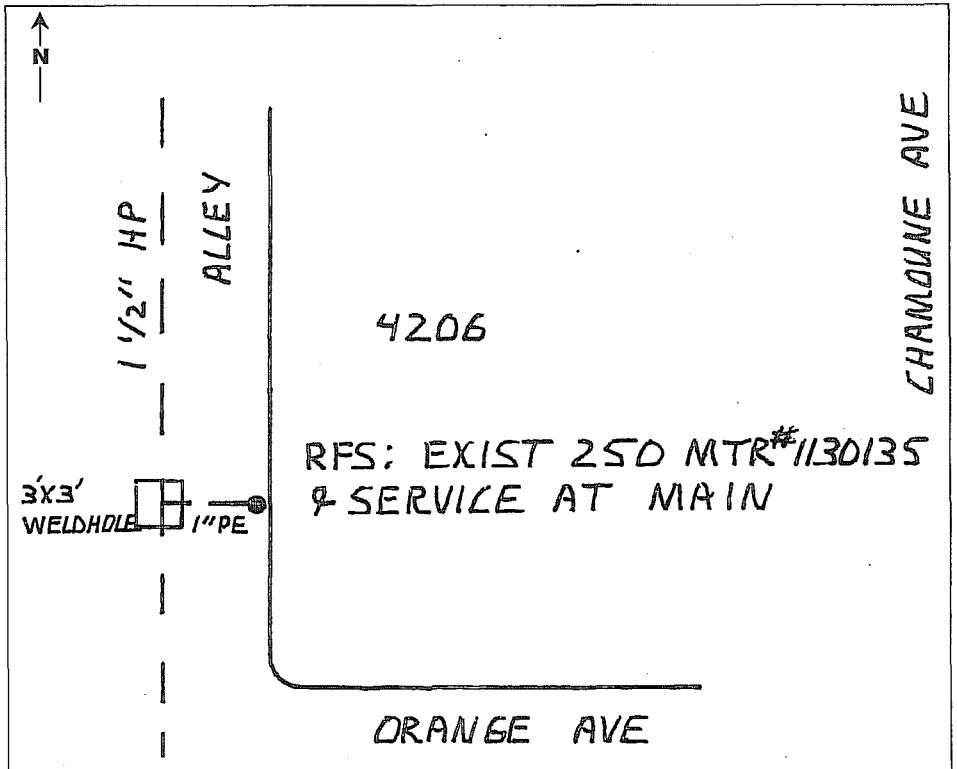
Trench By: Joint Trench With:



If SDG&E encounters hazardous or toxic material while performing construction of your project, SDG&E will halt work immediately and it will be your responsibility to remove and/or clean up all hazardous or toxic material prior to SDG&E continuing construction. SDG&E shall have no liability or obligation whatsoever to clean up, remove or remediate any hazardous or toxic materials discovered during the course of construction unless it is through negligence of SDG&E.

Customer-owned facilities to receive gas service are subject to all applicable local and state of California inspection authority requirements. Building address and/or houseline must be permanently identified prior to meter set. Information on this sheet is void after six (6) months. Keep this notice with building permit.

All installations performed under this order must meet SDG&E standards unless a written deviation has been approved.



☐ Right-of-way Required

Assessor's Parcel Number:

Additional Information:
Please call your Service Coordinator at 619-699-1039 with questions about application, inspection, construction installation and to schedule a crew.

Meter Separation from Electric Panel: N/A

Planner: **MICHAEL WIESNER** Telephone: **858-637-7923**

SDGE
A Sempra Energy utility®

8315 Century Park Court
San Diego, CA 92123-1548

FILE NO. PLA 580
Project No. 252431-030

June 05, 2015

PROJECT: **City of San Diego Fire Department #3061**

An Important Safety Bulletin From San Diego Gas & Electric®

Information on Natural Gas Odorant and Gas Safety

Dear Applicant,

You have requested natural gas service or an upsized meter to the location referenced by the project number above. **The purpose of this notice is to provide contractors who work on natural gas piping, appliances and equipment, and consumers of natural gas service, with additional safety information on natural gas odorant and the potential for odor fade.**

Natural Gas Odorant: SDG&E® adheres to Department of Transportation (DOT) and California Public Utilities Commission (CPUC) rules and regulations regarding the odorizing of natural gas. SDG&E adds an odorant to give natural gas a distinctive odor so leaks can be more readily detected. However, you should not rely on your sense of smell alone to determine if you have a gas leak.

Even though a distinctive odorant is present in the gas to assist in the detection of leaks, you should not rely on your sense of smell alone to determine if a gas leak exists or if natural gas is present. There are a number of reasons why your sense of smell might not be enough to alert you to the presence of a natural gas leak. For example, some persons may not be able to detect the odor because they have a diminished sense of smell or are experiencing olfactory fatigue (temporary, normal inability to distinguish odor after a prolonged exposure to it). Some physical conditions, including common colds, sinus conditions, allergies, eating certain foods, inattentiveness, and the use of tobacco, alcohol, drugs and certain medications may also lessen the ability to smell the odor. In addition, the odor may be masked or hidden by other odors that are present, such as cooking, damp, musty or chemical odors. And, certain conditions in pipe and soil may cause the odor to fade so that so that it is not detectable by smell.

Natural Gas Odor Fade (loss of odorant): "Odor fade" refers to the phenomenon in which physical and/or chemical processes cause the loss of odorant in natural gas so that its distinctive odor may no longer be detectable by smell. The processes that cause odor fade include adsorption, absorption, oxidation, or any combination thereof. A*d*sorption occurs when odorant molecules adhere to an exposed surface, such as the interior wall of a steel pipe. In a*b*sorption, odorant molecules are dissolved into or combined with another substance – such as cutting oil, pipeline liquids, or pipe thread compound - causing the odorant to have less odor. Oxidation occurs when rust or other compounds react with the odorant to change its chemical composition so that it is less odorous.

In gas piping systems, odor fade occurs predominantly in new steel pipe - steel pipe that has either been recently manufactured or which has not been previously used for odorized natural gas. Odor fade can also occur in previously used or existing gas pipe under certain conditions, such as where rust is present or when gas flow is limited or intermittent. Odor fade may also occur in pipe made of other materials.

While it is often more pronounced in pipe installations of larger diameter and longer length, odor fade can also occur in smaller and shorter pipe configurations.

A number of factors can cause or contribute to odor fade. For example, odor fade is more likely to occur in gas piping systems using higher gas pressure, and where there is little, intermittent or no gas flow. The presence of rust, mill scale, moisture, air, cutting oil, pipe thread compound, liquids, condensates and other substances in pipe and other components of gas piping systems can cause odor fade. Care should be taken in the selection and use of pipe to be utilized in natural gas piping systems. Such systems should be designed and configured to ensure that there is a continuous flow of gas though the entire system. In addition, care should be taken in the construction of such systems or when fabricating gas pipe to prevent the introduction of substances that may contribute to odor fade.

New pipeline installations or additions of new piping segments may require the odor conditioning of the pipe before it is placed into service to prevent occurrences of odor fade. This may be accomplished by extended purges of natural gas through the pipe or by direct odorant injection. Where necessary, the gas piping system may require repeat instances of conditioning and/or modification of the system – such as by stepping down pressure or reconfiguring the piping to ensure continuous gas flow – to prevent repeat occurrences of odor fade. **ODOR CONDITIONING, PURGING AND OTHER RELEASES OF NATURAL GAS SHOULD ONLY BE PERFORMED BY QUALIFIED GAS PROFESSIONALS.**

If a gas leak occurs in underground piping, the surrounding soil or fresh concrete can adsorb or oxidize the odorant so that the gas no longer has an odor. As a result, gas leaking from an underground pipe may not be detectable by smell.

Signs of a Natural Gas Leak: In addition to the distinctive odor of natural gas, other signs of a gas leak may include: a damaged connection to a gas appliance; an unusual sound such as a hissing, whistling or roaring sound near a gas appliance or pipeline; dead or dying vegetation in an otherwise moist area over or near pipeline areas; a fire or explosion near a pipeline; dirt or water being blown in the air; bubbling pools of water on the ground; or an exposed pipeline after an earthquake, fire, flood or other disaster.

Purges and Other Planned Releases of Natural Gas: Purging of gas lines, blow-downs and other planned releases of natural gas should only be performed by qualified gas professionals. Such gas release operations should only be performed in well-ventilated areas or by safely venting the contents of gas lines and equipment to the outside atmosphere away from people, animals, structures and sources of ignition. All possible ignition sources should be extinguished before and during such operations. Consider using gas detection equipment during all gas release operations to prevent gas from accumulating and creating a combustible or hazardous atmosphere. **DO NOT RELEASE THE CONTENTS OF A GAS LINE INTO A CONFINED SPACE**. The National Fuel Gas Code, the California Plumbing and Mechanical Codes, applicable Building and Safety Codes and local Departments of Building and Safety should be consulted for more information and before gas release operations begin. When installing gas appliances and/or equipment, the manufacturer's instruction manual should be followed in conjunction with the local code authority. **ANY RELEASE OF NATURAL GAS PRESENTS THE POTENTIAL FOR EXPLOSION AND FIRE THAT COULD RESULT IN SERIOUS INJURY AND DEATH. PURGING AND OTHER RELEASES OF NATURAL GAS SHOULD ONLY BE PERFORMED BY QUALIFIED GAS PROFESSIONALS AND REQUIRES THE EXERCISE OF EXTREME CAUTION.**

Please be sure to provide this letter to and discuss its contents with those that will be using natural gas at this location as well as to the design professionals, contractors, and others working with you or on your behalf to design, install, place into service, maintain, replace and/or repair the consumer's gas piping, regulators, appliances, fixtures, equipment and apparatus.

If you have any questions or concerns regarding any of the above, or require further assistance, please contact a licensed, qualified professional. You may also visit our website at www.sdge.com/safety/naturalgas for more information.

In order to proceed with your project, please print your name and provide your signature and date on the provided lines below, acknowledging receipt of this safety bulletin. Please return the signed letter in the envelope provided.

June 5, 2015

We appreciate this opportunity to serve you.

Sincerely,

Michael Wiesner

Michael Wiesner
Customer Project Planner
Telephone: (858) 637-7923

Enclosures

_____
(Print Name)

_____ _____
(Signature) (Date)

Applicant Signature acknowledges receipt of this notice for Project No. 252431-030.

SDGE
A Sempra Energy utility®

8315 Century Park Court
San Diego, CA 92123-1548

FILE NO. PLA 580
Project No. 252431-010/020
Project No. 252431-030/040

June 5, 2015

Mr. Darrold Davis
CCBG Architects, Inc.
3677 Voltaire Street
San Diego, CA 92106

Dear Mr. Davis:

PROJECT: City of San Diego Fire Department #3061

Thank you for requesting that SDG&E provide gas and electric service to your project. Meter and service location information, and other technical information is enclosed for your use. Construction responsibilities are outlined following. And, the related costs are attached as the "Cost Summary Sheet".

ELECTRIC SERVICE

Underground service will be supplied under the provisions of Electric Rule 16. Accordingly, you are responsible for providing a clear path, the trench, backfill, conduit and concrete substructure(s).

The manufacturer of your electrical equipment --if rated 1000 amperes or above-- must submit four (4) copies of the drawings to: SDG&E ENERGY MEASUREMENT and SERVICE STANDARDS at 8316 Century Park Ct., Suite CP52F, San Diego, CA 92123-1582. The submittal must be made prior to fabrication and must include the project address. One copy will be returned with approvals or corrections, as needed.

Please note that when five-inch service conduits are to be installed, a minimum of six-feet clear and level working space must be provided in front of the underground pull section to permit setup and operation of cable pulling equipment.

GAS SERVICE

Enclosed please find a notification addressed to you regarding Natural Gas Odorant. Please sign the notice in the space provided and return to your Planner as acknowledgement of your receipt.

We will install gas service pipe under the provisions of Gas Rule 16. That means you are responsible for providing a clear path, the trench, backfill, and pavement repair from the gas main to the gas meter location.

SDG&E maintains its gas lines up to the meter. You should be aware that if you install buried lines behind the gas meter, you are responsible for maintenance of those lines. Buried metallic

gas lines may be subject to corrosion. We recommend that gas lines be inspected, maintained and repaired by licensed plumbers or contractors.

SITE ACCESS – LINE TRUCK, METER, SERVICE, AND TRANSFORMER

SDG&E must have line truck access to gas and electric facilities for the purpose of installation, reading, testing, inspection, maintenance, and emergencies (refer to SDG&E Service Standards and guide sections 016, 005, 604, and 1006-1008).

If you are installing an electrically operated gate for your project, there are several things you need to know. First, 24-hour access to the gas and electric meters is required by the Fire Department and SDG&E. Because of the serious safety issues involved, we cannot set meters until access is guaranteed. You should contact the Fire Department to obtain their specific requirements, but our minimum requirements are:

1. A Schlage VTQP Quad Section cylinder in a key switch wired to the gate controller. A list of locksmiths authorized to sell SDG&E approved locks is available on request.

2. A means of opening the gate from the inside without the use of a vehicle to activate the controller. This will require the installation of an additional key switch inside the gate if there is no unsecured switch available.

TRENCHING, CONSTRUCTION, INSPECTION

After you have been notified by us that your construction order has been issued, you or your contractor must notify our Construction Department by phone, 48 hours prior to having the trench ready. Please call 619-699-1039 to arrange a pre-construction meeting or to discuss any construction-related questions.

So that you may effectively schedule your work, you should know that our Inspector is required to inspect your work at the following stages and you will need to call 619-699-1039 as each stage is ready.

- ❑ Trenching
- ❑ Conduit installation and mandrelling
- ❑ Backfill and compaction
- ❑ Substructure installation
- ❑ Completion stage (final inspection)

When calling our Construction Department, the following will identify your project:

Project Name:	**City of San Diego Fire Department #3061**	
Work Order #:	Electric: **2976620**	
Service Order #:	Electric: **252431-040**	Gas: **252431-020/030**

TRENCHING ADVISORIES

Prior to trenching/excavating, please contact DigAlert (USA Markout) at least 48 hours in advance at 811. We will locate and mark-out our facilities. Failure to call may result in serious injuries and/or substantial damage for which you will be responsible.

You, probably, will need an excavation permit from the City of San Diego prior to your excavation work. Additionally, you are responsible for obtaining any other necessary permits and for adhering to all applicable governmental and regulatory statutes, codes, and rules.

Finally, before you begin trenching, I strongly suggest you contact the local telephone and cable television companies for their requirements and any charges they may have.

Your responsibility for trenching includes all final street and sidewalk repair per City of San Diego Standards. Be sure you have checked with the City on the requirements for paver, brick, sidewalk, and street final repairs.

CHECKLIST

There are a few other things to be done before the meters actually can be set. I have prepared a checklist for your use.

- ❑ Your work must be completed and accepted, and SDG&E's portion of the work must be completed.
- ❑ Ensure that the address we have on record and your permit address match.
- ❑ Whoever is going to be responsible for the billing needs to call our Customer Contact Center and make application. The number is toll free**: 1-800-411-SDGE** (7343).
- ❑ We must receive either permanent or temporary inspection clearances from the City of San Diego.

At the time you request gas service, please provide the following information.

- Current plumbing plans
- Plumber or Point of Contact name and phone number

The gas meter can only be set after application for service, final acceptance of your work, completion of our work, and receipt of final building inspection clearance from the City. The as meter may be set, but until the purging and testing of the gas line takes place, the gas will not be turned on.

- A joint meet may be required with your plumber or point of contact at the time of the purge, test, and turn-on.
- If the original plumbing plans have changed, the most current plans or as-built will be required at the joint meet.
- **Allow 7 to 10 working days for the gas meter to be set, purged, and tested after receipt of the City inspection clearance.**

COSTS

All costs and offers quoted in this letter shall expire at the end of the business day on **September 08, 2015**. If business negotiations are not completed, or if you request revised costs after that date, an engineering fee may be required. Also, please understand that SDG&E is subject to California Public Utilities Commission decisions – any changes directed by the Commission can affect the quotes.

The costs quoted in this letter include a cost component to cover SDG&E's estimated liability for State and Federal Income Tax.

Since a portion of the work required to complete your project is to be performed by you, it is imperative that you complete that work in a timely manner. Within one year of the date SDG&E first releases your job for construction, all trench, conduit, and substructure work required of you must be completed. Should you not complete that work within one year, subsequently not allowing SDG&E to complete its required work, your job will be placed on hold pending review. If, at that time, you wish to continue, SDG&E will re-estimate the cost of the job. You may be asked to pay a cost update fee and to submit additional funds, if applicable, to cover SDG&E's current cost of construction. If you elect not to proceed with your project it will be cancelled.

Note: if you cancel your request, we will retain a portion of your payment to cover SDG&E's expense for processing. The remaining amount, if any, will be refunded to you.

ALLOWANCES

If, after six (6) months following the date SDG&E is first ready to serve residential loads for which allowances were granted, or one (1) year for non-residential loads for which allowances were granted, Applicant fails to take service, or fails to use the service contracted for, Applicant shall pay SDG&E an additional contribution, based on the allowances for the loads actually installed.

Project Management offices are unable to accept payments. If you wish to proceed, please mail all of the required paper work associated with the project, the enclosed Customer Payment Remittance, and your check for **$17,023.00** to:

Customer Payment Services - CP61C
San Diego Gas & Electric
P.O. Box 129831
San Diego, CA 92112-9831

Once your check is received, your construction orders will be issued.

THANK YOU

We appreciate your business and hope you are very satisfied with our service. For additional general information, you can visit our website at http://sdge.com. If I may be of further assistance or should you have any non-construction-related questions (easements, charges, etc.), please call me or my assistant at the number below. Our normal office hours are 7:00 a.m. to 4:00 p.m., Monday through Friday.

Sincerely,

Michael Wiesner

Michael Wiesner
Customer Project Planner
Telephone: (858) 637-7923

Enclosures

COSTS SUMMARY SHEET

Rule 16 Service - Electric

a.	Rule 16 service costs subject to allowances	$ 28,160.00	
b.	Applicable service extension allowances	$ <14,245.00>	
c.	Difference	$ 13,915.00	
d.	Tax	$ 4,460.00	
e.	Amount due		$ 18,375.00

Rule 16 Service - Gas

a.	Rule 16 service costs subject to allowances	$ 1,602.00	
b.	Applicable service extension allowances	$ <1,602.00>	
c.	Difference	$ .00	
d.	Amount due		$ .00

Removal Costs

e.	Gas service removal	$ 552.00	
f.	Underground electric service removal	$ .00	
g.	**Amount due**		$ 552.00

SUMMARY OF COSTS

Total electric service cost	$ 18,375.00	
Total gas service cost	$ .00	
Removal cost	$ 552.00	
Cost update fee	$ 221.00	
Engineering Fee	$<2,125.00>	
Grand Total due		**$ 17,023.00**

Note: This has been Paid by City of San Diego

☒ SDG&E

CUSTOMER PAYMENT REMITTANCE

Invoice/CR #	271740
Project #	252431
Date	June 04, 2015
Preparer	Kutsenda, Melanie

Customer/Project Name:	CITY OF SD FIRE DEPT #3061		
Project Location:	4206 CHAMOUNE AVE SD CA		
SDG&E Contact:	Wiesner,Mike	Telephone:	858-637-7923

PAYMENT DUE: $17,023.00

- Make checks payable to SDG&E -

Paid

MAIL TO:

Customer Payment Services - CP61C
San Diego Gas & Electric
PO Box 129831
San Diego, CA 92112-9831

THIS REMITTANCE MUST BE RETURNED WITH PAYMENT

SDGE
A Sempra Energy utility®

8315 Century Park Court
San Diego, CA 92123-1548

6·20·2013

FILE NO. PLA 580
Project No. 252431-030

BSE Engineering, INC.
9665 Chesapeake Dr, Suite 365
San Diego, CA 92123-1352

Dear Alan:

PROJECT: **City of San Diego Fire Department #3061**

An Important Safety Bulletin From San Diego Gas & Electric®

Information on Natural Gas Odorant and Gas Safety

Dear Applicant,

You have requested natural gas service or an upsized meter to the location referenced by the project number above. **The purpose of this notice is to provide contractors who work on natural gas piping, appliances and equipment, and consumers of natural gas service, with additional safety information on natural gas odorant and the potential for odor fade.**

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also occur in previously used or existing gas pipe under certain conditions, such as where rust is present or when gas flow is limited or intermittent. Odor fade may also occur in pipe made of other materials. While it is often more pronounced in pipe installations of larger diameter and longer length, odor fade can also occur in smaller and shorter pipe configurations.

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Signs of a Natural Gas Leak: In addition to the distinctive odor of natural gas, other signs of a gas leak may include: a damaged connection to a gas appliance; an unusual sound such as a hissing, whistling or roaring sound near a gas appliance or pipeline; dead or dying vegetation in an otherwise moist area over or near pipeline areas; a fire or explosion near a pipeline; dirt or water being blown in the air; bubbling pools of water on the ground; or an exposed pipeline after an earthquake, fire, flood or other disaster.

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Please be sure to provide this letter to and discuss its contents with those that will be using natural gas at this location as well as to the design professionals, contractors, and others working with you or on your behalf to design, install, place into service, maintain, replace and/or repair the consumer's gas piping, regulators, appliances, fixtures, equipment and apparatus.

If you have any questions or concerns regarding any of the above, or require further assistance, please contact a licensed, qualified professional. You may also visit our website at www.sdge.com/safety/naturalgas for more information.

In order to proceed with your project, please print your name and provide your signature and date on the provided lines below, acknowledging receipt of this safety bulletin. Please return the signed letter in the envelope provided.

We appreciate this opportunity to serve you.

Sincerely,

Michael Wiesner
Customer Project Planner
Telephone: (858) 637-7923

Enclosures

_____
(Print Name)

_____ _____
(Signature) (Date)

Applicant Signature acknowledges receipt of this notice for Project No. 252431-030.

Developer Portion

DP005DPS-REMOTE50-001 SAN DIEGO GAS AND ELECTRIC PAGE NO 2
06/17/13 06:53 DPSS - UG CONSTRUCTION ORDER FACE SHEET

WORK ORDER: 2976620 PROJECT: 252431 JOB:01 REV:0 TYPE: UD NAME: CITY OF SD FIRE DEPT #3061 IN:UG M&S STATUS: ACT

LOCATION: ADDRESS: 4206 CHAMOUNE AV CITY: SD THOMAS BROTHERS: 1269-J4

DISTRICT: CM ADDRESS: 701-C 33RD ST SAN DIEGO 92102 PH: 619-699-1039 COST CENTER: SLO:

DESIGNED BY: MICHAEL WIESNER PH: 858-637-7923 DATE ISSUED: SIO:

JOB COORD: MICHAEL WIESNER PH: 858-637-7923 PROJECT MGR: MICHAEL WIESNER PH: 858-637-7923

APPROVED BY: William Batt DATE: 6/18/13 COMBO JOB:N

WORK REQ#	RULE	OPT	BILL CODE	ORDER TYPE	QTY	BUDGET	BUDGET %	TOTAL CAPITAL	BILLABLE CAPITAL	%	DEPREC CREDIT	NET CAPITAL	TOTAL O&M	BILLABLE O&M	%	NET O&M
001	E-16	D	X	30	0001	12218.1	100.0	12378	0	0.0		12378	962	0	0.0	962

SCHED START DATE: / / SCHED COMP DATE: / / COMPLETED/APPROVED BY: _____ DATE: _____

REQUIRED ACCOUNTS

5108.40000 5184.63200 5367.10000 5369.20000 5594.50000

JOINT CONSTRUCTION CONTRACTOR DESIGN: ____ APPLICANT DESIGN: ____
UG ELECT: Y
GAS: Y
TELCO: Y TELCO ENG: PHONE:
MPOE: N
CATV: Y CATV ENG: PHONE:
COMMENTS:

RIGHT-OF-WAY REQUIRED: N INFO:
PERMITS REQUIRED: N AGENCY:
TRAFFIC CONTROL REQ: N PLAN NO: STREET RESURFACE MORATORIUM: CUSTOMER OUTAGE REQUIRED: N
COMMENTS:

EXISTING FACILITIES INSTALLED ON: 3253206

RELATED CONSTRUCTION JOBS

WO#	PROJ	JOB	REV	TYPE	NAME
NO RELATED CONSTRUCTION JOBS FOUND					

PLANS / REFERENCE MAPS

TYPE	NUMBER	DESCRIPTION
EF	214-1737	ELECTRIC FACILITY MP
UO	214-1737	UNDERGROUND OPER MAP

WORK ORDER: 2976620 PROJECT: 252431 JOB:01 REV:0 TYPE: UD NAME: CITY OF SD FIRE DEPT #3061 IN;UG M&S STATUS: ACT

STANDARD CONSTRUCTION NOTES

STAKED BY DEVELOPER.

UNLESS OTHERWISE NOTED, ALL TERMINATIONS OF PRIMARY CONDUIT RUNS AND SECONDARY CONDUIT RUNS OTHER THAN 2" IN ABOVE GROUND PADS WILL BE MADE WITH 36" RADIUS 90 DEGREE BENDS. TERMINATIONS OF 2" SECONDARY CONDUIT RUNS IN ABOVE GROUND PADS WILL BE MADE WITH 24" RADIUS 90 DEGREE BENDS. ALL HORIZONTAL BENDS WILL BE MADE WITH 25' RADIUS SWEEPS, UNLESS OTHERWISE NOTED. STANDARD CONDUIT BENDS TO BE USED. THE MINIMUM TERMINATION FOR ANY SERVICE CONDUIT IS A 24" RADIUS 90 DEGREE BEND.

__ UNLESS OTHERWISE NOTED, IF SERVICES ARE NOT INSTALLED WITH THE MAIN SYSTEM, INSTALL CONDUIT STUBS FROM PADS AND HANDHOLES TO P/L. ALL STUBS REQUIRE CONDUIT STUB AND BALL MARKERS PER UG STANDARD 3377. SERVICE STUBS TO BE _____.

APPLICANT NOTES

IN THE EVENT OF CONFLICT BETWEEN THIS DRAWING AND THE GENERAL CONDITIONS, THE GENERAL CONDITIONS SHALL TAKE PRECEDENCE. A COMPLETE SET OF UTILITY CONSTRUCTION SPECIFICATIONS IS AVAILABLE ON REQUEST.

CHECK CONFLICTS IN AREA PRIOR TO ANY EXCAVATION. CALL 'USA' AT 1-800-422-4133 48 HOURS IN ADVANCE OF ANY GRADING OR EXCAVATION IN THE VICINITY OF SDGE FACILITIES. IT IS NECESSARY TO OBTAIN AN EXCAVATION PERMIT FROM THE LOCAL AUTHORITY.

AFTER NOTIFICATION THAT CONSTRUCTION CAN PROCEED, PHONE NOTIFICATION 48 HOURS PRIOR TO THE START OF CONSTRUCTION MUST BE MADE TO THE CONSTRUCTION DEPARTMENT AT THE DISTRICT PHONE NUMBER INDICATED ON THE PREVIOUS PAGE.

FOR INSPECTION OF YOUR INSTALLATION AND ANY FIELD CHANGES PHONE SDGE INSPECTOR AT THE DISTRICT OPERATING CENTER.

X PRECONSTRUCTION CONFERENCE WITH DISTRICT OPERATING DEPARTMENT REQUIRED.

X TRENCH FOOTAGE - APPLICANT: 100% SDGE: 0 %

__ GAS WORK ORDER IS APPLICANT INSTALLATION. WO# _____.

SPECIFIC CONSTRUCTION NOTES

NO CONSTRUCTION NOTES FOUND

ORDER: 2976620 PROJECT: 252431 JOB: 01 REV: 0 TYPE: UD NAME: CITY OF SD FIRE DEPT #3061 IN:UG M&S STATUS: ACT

RICT: CM DESIGNED BY: MICHAEL WIESNER PHONE: 637-7923

ATION	WRK F-C	MU ID	AU ID	DESCRIPTION	QTY RQD	UM	WORK RESP	MATL RESP	STANDARD PAGE
02	I-N		TR/C-P	PRIMARY CUSTOMER TRENCH	120	FT	C	C	3370.1
	I-N		SHD--C	SHADE TRENCH WITH SAND - CUSTOMER	120	FT	C	C	D7403
	I-N		1DB4PS	1-4 IN DB 22.5 D 25 FT R BEND PRI	4	EA	C	C	3373.2
	I-N		1DB4-P	1-4 IN DB CONDUIT PRI	80	FT	C	C	3373.1
03	I-N		X25-3P	PAD PREP 3425 PAD (3-PHASE TRANSFORMER)	1	EA	C	C	3425.2
	I-N		3425-3	PAD 3425 3-PHASE TRANSFORMER	1	EA	C	C	3425.1
	I-N		TG-T-W	TRENCH GRD WIRE W/O RODS (TRANS/CAP)	1	EA	C	C	4510.1
	I-N		1DB4-B	1-4 IN DB 90 D 36 IN R BEND PRI	1	EA	C	C	3373.2
	I-N		2-4"SB	2-4 IN DB SERV COND BENDS BY CUSTOMER	1	EA	C	C	
04	I-N		TR/CSV	SERVICE CUSTOMER TRENCH	100	FT	C	C	
	I-N		2-4"SR	2-4 IN DB SERV COND RUN BY CUSTOMER	1	EA	C	C	
	I-N		2-4"SB	2-4 IN DB SERV COND BENDS BY CUSTOMER	1	EA	C	C	

ORDER: 2976620 PROJECT: 252431 JOB: 01 REV: 0 TYPE: UD NAME: CITY OF SD FIRE DEPT #3061 IN:U0 M&S STATUS: ACT

RICT: CM ADDRESS: 701-C 33RD ST SAN DIEGO 92102 PHONE: 699-1039 COST CENTER:

GNED BY: MICHAEL WIESNER PHONE: 637-7923 LOCATIONS: THROUGH:

MATERIAL TO BE PROVIDED BY CUSTOMER AND INSTALLED BY CUSTOMER SHEET: 1

CK NUMBER	DESCRIPTION	ACCT STAT	ACCOUNT	QUANTITY REQUIRED	UM	ISSUED	CREDIT
249710	CONDUIT DB 100 4 IN 20 FT LENGTH	NE	369.20000	80	FT		
321826	4 IN DB 100 22.5 D R BEND	NE	369.20000	4	EA		
322082	4 IN DB 100 90 D 36 IN R BEND	NE	369.20000	1	EA		
424390	INHIBITOR, GROUND ENHANCING POWDER	NE	369.20000	5	EA		
513998	PAD 3-PHASE TRANSFORMER 3425	NE	369.20000	1	EA		
812816	WIRE BARE COPPER #2-7 STR SOFT DRAWN	NE	369.20000	8	LB		
X20042	PRI, SEC, & GAS ONLY TRENCH BY CUSTOMER	DC	369.20000	120	FT		

ORDER: 2976620 PROJECT: 252431 JOB:01 REV:0 TYPE: UD NAME: CITY OF SD FIRE DEPT #3061 IN:UG M&S STATUS: ACT

TION: ADDRESS: 4206 CHAMOUNE AV CITY: SD THOMAS BROTHERS: 1269-J4

RICT: CM ADDRESS: 701-C 33RD ST SAN DIEGO 92102 PHONE: 699-1039 COST CENTER:

GNED BY: MICHAEL WIESNER PHONE: 637-7923 DATE ISSUED: _____

COORD: MICHAEL WIESNER PHONE: 637-7923 PROJECT MGR: MICHAEL WIESNER PHONE: 637-7923

ONE-WAY TRAVEL HOURS: 0.5 YARD TIME: 1.2 TRAVEL YARD FACTOR: 0.3793

ORDER: 2976620 PROJECT: 252431 JOB:01 REV:0 TYPE: UD NAME: CITY OF SD FIRE DEPT #3061 IN:UG M&S STATUS: ACT

TION: 001 SHEET: 01 DISTRICT: CM DESIGNED BY: MICHAEL WIESNER PHONE: 637-7923 LOCATION 001 OF 004

-T	MU ID	AU ID	STOCK#	DESCRIPTION/CONSTRUCTION NOTES	QTY RQD	UM	ACT QTY	WRK RSP	MAT RSP	ACCOUNT	STNDRD PAGE	INST/APP BY	DATE
				NO DESIGN UNITS FOR THIS LOCATION									

K C	FAC CODE	DESC	EXIST TAG	NEW TAG	CONSTRUCTION NOTES
			H123428		NO LOCATION CONSTRUCTION NOTES FOUND

001 SHEET 01 |_| COMPLETED |_| PARTIALLY COMPLETED |_| ENERGIZED

UILT RECORDED BY: _____ DATE: _____ MATERIAL CHECK BY: _____ DATE: _____

ORDER: 2976620 PROJECT: 252431 JOB:01 REV:0 TYPE: UD NAME: CITY OF SD FIRE DEPT #3061 IN:UG M&S STATUS: ACT

TION: 002 SHEET: 01 DISTRICT: CM DESIGNED BY: MICHAEL WIESNER PHONE: 637-7923 LOCATION 002 OF 004

-T	MU ID	AU ID	STOCK#	DESCRIPTION/CONSTRUCTION NOTES	QTY RQD	UM	ACT QTY	WRK RSP	MAT RSP	ACCOUNT	STNDRD PAGE	INST/APP BY	DATE
-S		TR/C-P		PRIMARY CUSTOMER TRENCH	120	FT		C		369.20000	3370.1		
			X20042	PRI, SEC, & GAS ONLY TRENCH BY CUSTOMER	120	FT			C				
-S		SHD--C		SHADE TRENCH WITH SAND - CUSTOMER	120	FT		C		369.20000	D7403		
-S		1DB4PS		1-4 IN DB 22.5 D 25 FT R BEND PRI	4	EA		C		369.20000	3373.2		
			321826	4 IN DB 100 22.5 D R BEND	4	EA			C				
-S		1DB4-P		1-4 IN DB CONDUIT PRI	80	FT		C		369.20000	3373.1		
			249710	CONDUIT DB 100 4 IN 20 FT LENGTH	80	FT			C				

K C FAC CODE DESC EXIST TAG NEW TAG CONSTRUCTION NOTES

NO FACILITY TAGS FOUND NO LOCATION CONSTRUCTION NOTES FOUND

002 SHEET 01 |_| COMPLETED |_| PARTIALLY COMPLETED |_| ENERGIZED

UILT RECORDED BY: _____ DATE: _____ MATERIAL CHECK BY: _____ DATE: _____

ORDER: 2976620 PROJECT: 252431 JOB:01 REV:0 TYPE: UD NAME: CITY OF SD FIRE DEPT #3061 IN:UG M&S STATUS: ACT

TION: 003 SHEET: 01 DISTRICT: CM DESIGNED BY: MICHAEL WIESNER PHONE: 637-7923 LOCATION 003 OF 004

-T	MU ID	AU ID	STOCK#	DESCRIPTION/CONSTRUCTION NOTES	QTY RQD	UM	ACT QTY	WRK RSP	MAT RSP	ACCOUNT	STNDRD PAGE	INST/APP BY	DATE
-S		X25-3P		PAD PREP 3425 PAD (3-PHASE TRANSFORMER)	1	EA		C		369.20000	3425.2		
-S		3425-3		PAD 3425 3-PHASE TRANSFORMER	1	EA		C		369.20000	3425.1		
			513998	PAD 3-PHASE TRANSFORMER 3425	1	EA			C				
-S		TG-T-W		TRENCH GRD WIRE W/O RODS (TRANS/CAP)	1	EA		C		369.20000	4510.1		
			424390	INHIBITOR, GROUND ENHANCING POWDER	5	EA			C				
			812816	WIRE BARE COPPER #2-7 STR SOFT DRAWN	8	LB			C				
-S		1DB4-B		1-4 IN DB 90 D 36 IN R BEND PRI	1	EA		C		369.20000	3373.2		
			322082	4 IN DB 100 90 D 36 IN R BEND	1	EA			C				
-S		2-4"SB		2-4 IN DB SERV COND BENDS BY CUSTOMER	1	EA		C		369.20000			

K C	FAC CODE	DESC	EXIST TAG	NEW TAG	CONSTRUCTION NOTES
	PD	PAD		D213328	INSTALL TRANSFORMER INSIDE PL AND A MINIMUM OF 2'EAST OF
	TR	3 PHASE XFORMER		431-531	EXTERIOR WALL

003 SHEET 01 |_| COMPLETED |_| PARTIALLY COMPLETED |_| ENERGIZED

UILT RECORDED BY: _____ DATE: _____ MATERIAL CHECK BY: _____ DATE: _____

ORDER: 2976620 PROJECT: 252431 JOB:01 REV:0 TYPE: UD NAME: CITY OF SD FIRE DEPT #3061 IN:UG M&S STATUS: ACT

TION: 004 SHEET: 01 DISTRICT: CM DESIGNED BY: MICHAEL WIESNER PHONE: 637-7923 LOCATION 004 OF 004

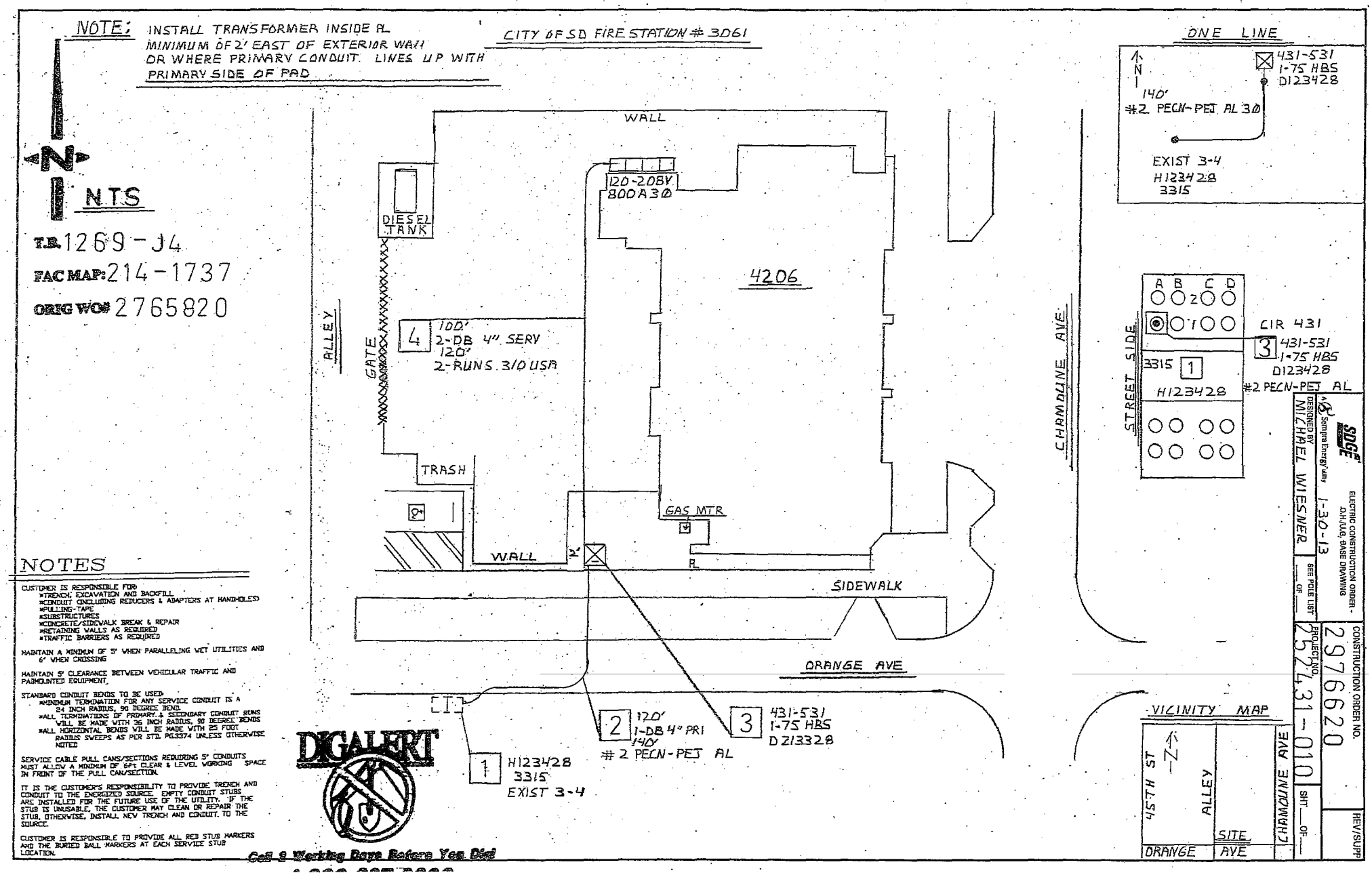
-T	MU ID	AU ID	STOCK#	DESCRIPTION/CONSTRUCTION NOTES	QTY RQD	UM	ACT QTY	WRK RSP	MAT RSP	ACCOUNT	STNDRD PAGE	INST/APP BY	DATE
-S		TR/CSV		SERVICE CUSTOMER TRENCH	100	FT		C		369.20000			
-S		2-4"SR		2-4 IN DB SERV COND RUN BY CUSTOMER	1	EA		C		369.20000			
-S		2-4"SB		2-4 IN DB SERV COND BENDS BY CUSTOMER	1	EA		C		369.20000			

K C FAC CODE DESC EXIST TAG NEW TAG CONSTRUCTION NOTES

NO LOCATION CONSTRUCTION NOTES FOUND

004 SHEET 01 ☐ COMPLETED ☐ PARTIALLY COMPLETED ☐ ENERGIZED

UILT RECORDED BY: _____ DATE: _____ MATERIAL CHECK BY: _____ DATE: _____


NOTE: INSTALL TRANSFORMER INSIDE PL MINIMUM OF 2' EAST OF EXTERIOR WALL OR WHERE PRIMARY CONDUIT LINES UP WITH PRIMARY SIDE OF PAD
CITY OF SD FIRE STATION # 3061
N
NTS
T.B. 1269-J4
FAC MAP: 214-1737
ORIG WO# 2765820
WALL
120-208V 800A 3Ø
DIESEL TANK
4206
ALLEY
GATE
4 100' 2-DB 4" SERV 120' 2-RUNS 3/0 USA
TRASH
GAS MTR
WALL
SIDEWALK
ORANGE AVE
CHAMOUNE AVE
1 H123428 3315 EXIST 3-4
2 120' 1-DB 4" PRI 140' #2 PECN-PEJ AL
3 431-531 1-75 HBS D21332B
ONE LINE
431-531 1-75 HBS D123428
140' #2 PECN-PEJ AL 30
EXIST 3-4 H123428 3315
A B C D 2 1
CIR 431
3 431-531 1-75 HBS D123428 #2 PECN-PEJ AL
STREET SIDE
3315 1 H123428
NOTES
CUSTOMER IS RESPONSIBLE FOR
*TRENCH, EXCAVATION AND BACKFILL
*CONDUIT (INCLUDING REDUCERS & ADAPTERS AT HANDHOLES)
*PULLING-TAPE
*SUBSTRUCTURES
*CONCRETE/SIDEWALK BREAK & REPAIR
*RETAINING WALLS AS REQUIRED
*TRAFFIC BARRIERS AS REQUIRED
MAINTAIN A MINIMUM OF 5' WHEN PARALLELING WET UTILITIES AND 6' WHEN CROSSING
MAINTAIN 5' CLEARANCE BETWEEN VEHICULAR TRAFFIC AND PADMOUNTED EQUIPMENT.
STANDARD CONDUIT BENDS TO BE USED
*MINIMUM TERMINATION FOR ANY SERVICE CONDUIT IS A 24 INCH RADIUS, 90 DEGREE BEND.
*ALL TERMINATIONS OF PRIMARY & SECONDARY CONDUIT RUNS WILL BE MADE WITH 36 INCH RADIUS, 90 DEGREE BENDS
*ALL HORIZONTAL BENDS WILL BE MADE WITH 25 FOOT RADIUS SWEEPS AS PER STD. PG3374 UNLESS OTHERWISE NOTED
SERVICE CABLE PULL CANS/SECTIONS REQUIRING 5' CONDUITS MUST ALLOW A MINIMUM OF 6ft CLEAR & LEVEL WORKING SPACE IN FRONT OF THE PULL CAN/SECTION.
IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRENCH AND CONDUIT TO THE ENERGIZED SOURCE. EMPTY CONDUIT STUBS ARE INSTALLED FOR THE FUTURE USE OF THE UTILITY. IF THE STUB IS UNUSABLE, THE CUSTOMER MAY CLEAN OR REPAIR THE STUB, OTHERWISE, INSTALL NEW TRENCH AND CONDUIT, TO THE SOURCE.
CUSTOMER IS RESPONSIBLE TO PROVIDE ALL RED STUB MARKERS AND THE BURIED BALL MARKERS AT EACH SERVICE STUB LOCATION.
DIGALERT
Call 2 Working Days Before You Dig!
VICINITY MAP
45TH ST
ALLEY
SITE
ORANGE AVE
CHAMOUNE AVE
DESIGNED BY MICHAEL WIESNER 1-30-13
SEE POLE LIST
SHT OF
ELECTRIC CONSTRUCTION ORDER - O.H./U.G. BASE DRAWING
CONSTRUCTION ORDER NO. 2976620
PROJECT NO. 25243 1-010
REV/SUPP

SDGE
A Sempra Energy utility

Electric Service Information

July 20, 2015

NAM NGUYEN

Project TEMPORARY FIRE STATION #17
Project ID# 553583
Location 4000 41st St TP S D

Your service order to serve Temp Power at the above project is now ready to begin the construction process Please feel free to call the Project Coordinator at 619-699-1039 to discuss any construction-related questions

Please Note: Requesting multiple revisions to your service order will require a re-design fee.

Please Note: If you cancel your request, we will retain a portion of your payment to cover SDG&E's expense for processing. The remaining amount, if any, will be refunded to you.

If your service order indicates that you will be required to obtain excavation and/or encroachment permits from the Municipality prior to commencing any work, please secure your permit as quickly as possible to avoid unnecessary delays

When applying for the permit and/or calling your SDG&E Project Coordinator in regards to your project, please reference the Project, Project ID# and Location listed above.

Please verify that the address assigned by your municipality matches the address above If it doesn't, notify us immediately so we can change our records to the correct address This will reduce confusion and expedite your meter being set. For new buildings or meters, please remember that you will need to call 1-800-411-7343 to set up your billing accounts for the new meter.

You are reminded that the installation of your metering equipment is subject to codes and inspection clearance prior to establishing service After the governmental agencies inspect electric installation and SDG&E's work is complete, it will take approximately three days for a meter set

If you have any questions, please call your Service Coordinator at the number listed above Our hours are 7 00 a m - 4:00 p m., Monday through Friday

Thank you,

MICHAEL WIESNER, Planner

SDGE
A Sempra Energy utility

ELECTRIC OVERHEAD METER & SERVICE LOCATION

Customer Copy

T.B. 1269-G5

Wanted Date **ON INSPECTION** Service Type **OH Service Temporary** Customer Type **Commercial** Date Prepared **07/13/2015**

Project No **553583**	Job No **010**
Project Title **TEMPORARY FIRE STATION #17**	
Project Address **4000 41ST ST TP**	
Project City **SAN DIEGO**	Customer Phone #
Contact **NAM NGUYEN**	Contact Phone # **858-243-7231**
☐ Traffic Control Permit Required	
Excavation/Encroachment Permits Required By	

Service Attachment Point and/or Meter Location **Install 400 amp temporary meter Panel within 25 feet of pole P2132873697 near fence. Meter Panel must be within 20 feet of driveable surface for truck access. Face meter toward driven way and permanently label with address.**
4000 41st St TP
Temporary fee of $1178.00 will appear on first month's bill. IT IS THE CUSTOMERS RESPONSIBILITY FOR GATE BEING ACCESSABLE TO SDGE 24 HOURS A DAY / 7 DAYS A WEEK.
GATE OPENING MUST BE 16' WIDE PER SDGE STANDARDS.

☒ SDG&E Application Required – Call **1-800-411-7343**

Municipal Inspection Required By **City of San Diego**

Meter height – 4'0" min (3'0" min for multiple meter installation) – 6'3" max From finish grade to centerline of meter base Meters are required to be readily accessible 24 hours per day Meters must be located in a safe area free of any potentially hazardous or dangerous condition Provide 3-ft X 3-ft Minimum clear and level working space in front of meter Where meter room is proposed, contact the planner at the nearest SDG&E office

Meter bases and meter service disconnects must be located at or immediately adjacent to each other and be identified with address and unit number it serves

Power Source **366-319**	Structure Number **P2132873697**

Provide Minimum Ground Clearance Of
10 FT From bottom of drip loop at service wire point of attachment
12 FT Over driveway or parking area
16 FT At outer limit of vehicular traffic

Service Panel Rating **400** Number/Size of Main Switch(es) **1 @ 400A**

# of Wires **3** Phase **Single** Voltage **120/240**

Utilities Maximum Contribution To Fault Current **42000** Amps

Metering **CT** Meter Clips **6**

Temp Service Charge Due on First Bill $ **1178**

N

Additional Information ☐ Right-of-way Required Assessor's Parcel Number

Please call your Service Coordinator at 619-699-1039 with questions about application, inspection, construction installation and to schedule a crew.

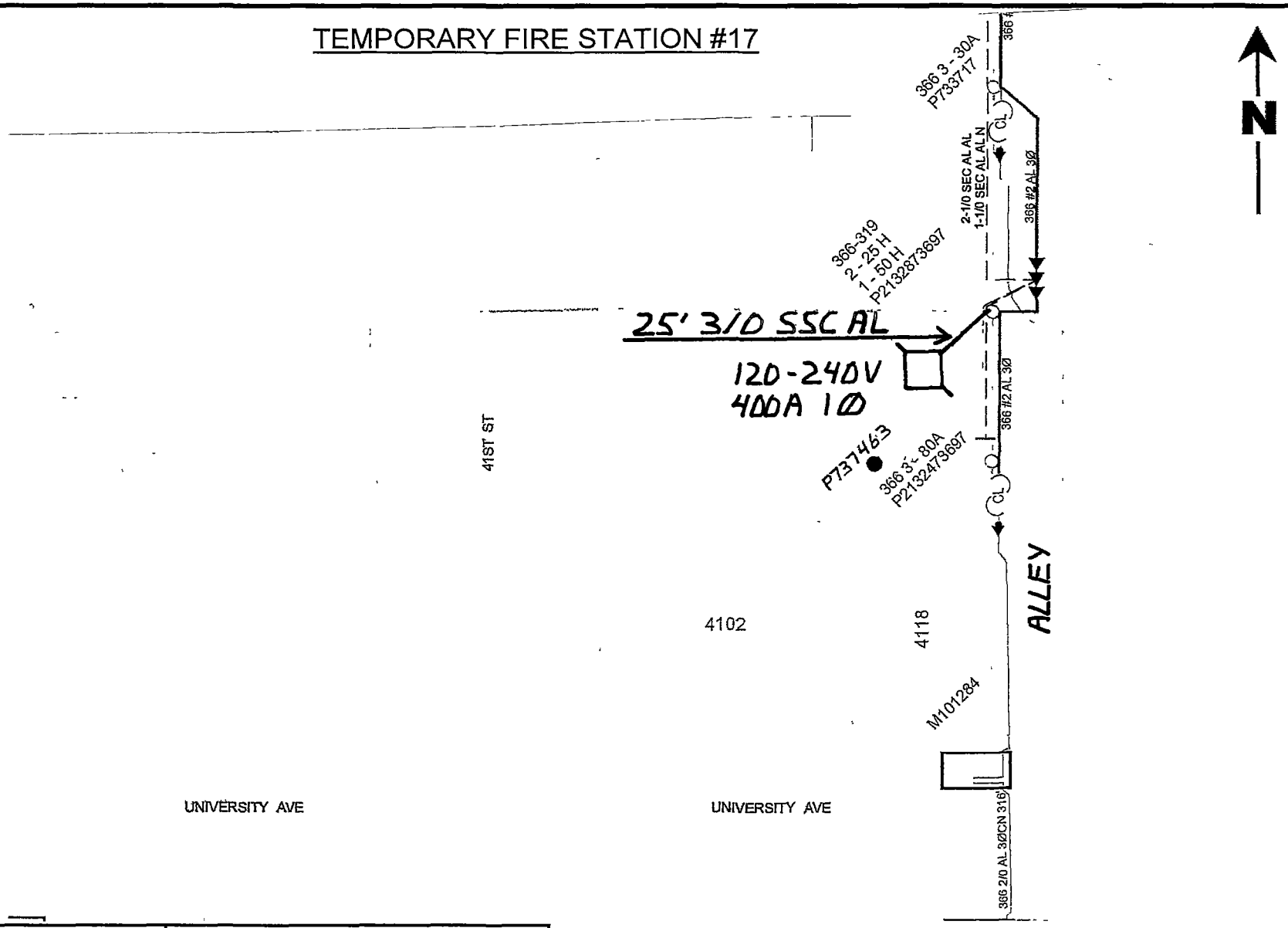
If SDG&E encounters hazardous or toxic material while performing construction of your project, SDG&E will halt work immediately and it will be your responsibility to remove and/or clean up all hazardous or toxic material prior to SDG&E continuing construction SDG&E shall have no liability or obligation whatsoever to clean up, remove or remediate any hazardous or toxic materials discovered during the course of construction unless it is through negligence of SDG&E

Customer-owned facilities to receive electrical service are subject to all applicable local and state of California inspection authority requirements Building address and/or meter base must be posted prior to meter set. Information on this sheet is void after six (6) months from date Keep this notice with building permit.

All installations performed under this order must meet SDG&E standards unless a written deviation has been approved

Planner **MICHAEL WIESNER**	Telephone **858-637-7923**

TEMPORARY FIRE STATION #17



DPSS # 553583-010 WO# 5005911	Date: 07-12-2015
Planner Name: MICHAEL WIESNER	Planner Phone: 858-637-7923
Customer Name: NAM NGUYEN	Customer Phone: 858-243-7231
4000 41st St TP	

DIGALERT

Call 811: Two Working Days Before You Dig!

SDGE

A Sempra Energy Utility

APPENDIX I

ASBESTOS REPORT

THE CITY OF SAN DIEGO

ENVIRONMENTAL SERVICES DEPARTMENT

ASBESTOS & LEAD MANGEMENT PROGRAM

SUMMARY SCOPE OF WORK

SECTION 02081

for

Asbestos, Lead & Universal Waste Abatement

on

Fire Station 17

July 15, 2014

Prepared by:

Alan J. Johanns
Asbestos & Lead Program Manager
CA Asbestos Consultant # 92-0842
CDPH I/A #7770

George Katsikaris
Asbestos & Lead Program Inspector
CA Asbestos Consultant # 07-4265
CDPH I/A # 20618

City of San Diego
Environmental Services Department
Office of Energy, Sustainability and Environmental Protection
Asbestos & Lead Management Program
9601 Ridgehaven Court, Ste 320
San Diego, CA 92123
Tel: (858) 492-5086
Fax: (858) 492-5089

SECTION 02081 – ASBESTOS, LEAD & UNIVERSAL WASTE

PART 1 - GENERAL

1.1 SUMMARY SCOPE OF WORK

1.1.1 The City of San Diego's Asbestos and Lead Management Program (ALMP) has performed a hazardous materials inspection of Fire Station 17 to identify asbestos, lead and Universal Waste (refer to Appendix A for a summary). The ALMP's ABATEMENT CONTRACTOR will perform the following removal/abatement of hazardous materials prior to and in coordination with the CONTRACTOR's demolition work. All abatement activity will be monitored by the ALMP's assigned PROJECT MONITOR. Removal will include the following:

1) All identified asbestos containing materials (ACM) which includes floor tile and mastic present under the carpet and base cove mastic throughout the Dorms and Bullpen. Asbestos containing window putty is also present on all exterior windows. All roof penetration and seam mastics also were found to be asbestos containing.

2) Lead containing paint is present on exterior windows in concentrations below 0.5 mg/cm^2 but above 0.1 mg/cm^2 and is not well adhered to the substrate. While this is below regulatory concentrations lead safe work practices, including wet methods and dust controls, will still be utilized in preparing windows for removal. This includes removal of all loose and flaking paint present on the windows.

3) Mercury containing fluorescent light bulbs and PCB containing ballasts which are present throughout the building.

NOTE: The removal of these materials prior to issuance of NTP shall NOT be included in the cost of this contract.

2.1 SAMPLE COLLECTION

2.1.1 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 not yet been tested throughout work activities.

NOTE: If suspected asbestos materials or paint not shown in Appendix A are identified and will be impacted as a result of the demolition work, notify the CONSTRUCTION MANAGER.

2.1.2 As soon as possible, the City's PROJECT MONITOR will undertake confirmation of the material and determine if additional abatement is required. If additional abatement is required, the ABATEMENT CONTRACTOR will conduct such abatement at no cost to the CONTRACTOR.

2.1.3 The CONTRACTOR shall remain out of that work area if abatement is required. There will be no additional financial compensation to the CONTRACTOR during the removal of this asbestos or lead containing materials.

2.1.4 If the CONTRACTOR salvages components or building materials that have 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.

2.1.5 Debris generated from demolition that will be salvaged via crushing shall be segregated into separate piles for lead containing and non-lead containing. The CONTRACTOR shall perform testing for lead on all crushed concrete and other aggregate materials they may be reusing or selling.

2.1.6 Immediately following demolition but prior to disposal a representative sample must be collected by the CONTRACTOR, have a waste characterization performed, and then properly disposed of.

** END OF SECTION **

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 17. This inspection was completed August 12, 2010.

2. Lead and Asbestos Bulk Sample Laboratory Results

Fire Station 17 – Asbestos Sample Results				
Sample #	**Material**	**Location**	**Condition**	**% Asbestos**
6499-1A	Floor tile and mastic	Dorm	Good	>1% Chrysotile
6499-2A	Window Putty	Bullpen	Good	2% Chrysotile
6499-3A	Wallboard	Dorm	Good	ND*
6499-3B	Wallboard	Bullpen	Good	ND*
6499-4A	Ceiling tile	Dorm	Good	ND*
6499-4B	Ceiling tile	Bullpen	Good	ND*
6499-5A	Baseboard Mastic	Dorm	Good	< 1% Chrysotile
6499-5B	Baseboard Mastic	Bullpen	Good	ND*
6499-6A	Black roof mastic	Roof	Good	3% Chrysotile
6491-1	Exterior stucco	Exterior	Good	ND*
6491-2	Interior plaster	Kitchen	Good	ND*

*No Asbestos Detected

Fire Station 17 –Lead Sample Results					
SAMPLE #	**LOCATION**	**COMPONENT**	**SUBSTRATE**	**CONTENT**	**CONDITION**
XRF-10	Kitchen	Wall	Plaster	0.0 mg/cm^2	Intact
XRF-12	Apparatus Bay	Wall	Plaster	0.0 mg/cm^2	Intact
XRF-14	Apparatus Bay	Wall	Plaster	0.0 mg/cm^2	Intact
XRF-15	Apparatus Bay	Door	Wood	0.01 mg/cm^2	Intact
XRF-16	Apparatus Bay	Door Frame	Wood	0.0 mg/cm^2	Intact
XRF-17	Bullpen	Ceiling	Plaster	0.02 mg/cm^2	Intact
XRF-18	Bullpen	Ceiling	Plaster	0.05 mg/cm^2	Intact
XRF-19	Bullpen	Ceiling	Plaster	0.02 mg/cm^2	Intact

Fire Station 17 –Lead Sample Results					
XRF-22	Bullpen	Door Frame	Wood	0.01 mg/cm^2	Intact
XRF-23	Dormitory	Door	Wood	0.0 mg/cm^2	Intact
XRF-24	Dormitory	Door Frame	Wood	0.0 mg/cm^2	Intact
XRF-25	Dormitory	Wall	Plaster	0.0 mg/cm^2	Intact
XRF-26	Dormitory	Wall	Plaster	0.03 mg/cm^2	Intact
XRF-27	Dormitory	Wall	Plaster	0.0 mg/cm^2	Intact
XRF-28	Dormitory	Wall	Plaster	0.0 mg/cm^2	Intact
XRF-29	Exterior	Wall	Stucco	0.01 mg/cm^2	Intact
XRF-30	Exterior	Wall	Stucco	0.0 mg/cm^2	Intact
XRF-31	Exterior	Wall	Stucco	0.0 mg/cm^2	Intact
XRF-32	Exterior	Wall	Stucco	0.01 mg/cm^2	Intact
XRF-33	Exterior	Wall	Stucco	0.01 mg/cm^2	Intact
XRF-34	Exterior	Window	Metal	0.4 mg/cm^2	Intact
XRF-35	Exterior	Window	Metal	0.3 mg/cm^2	Intact

Fire Station 17 –Universal Waste			
PCB-Containing Fluorescent Light Ballasts (FLBs)	App. 100 Total	Mercury Containing Thermostats	App. 10 Total

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 then work must stop in the affected until additional testing can be conducted.

** END OF APPENDIX A **

THE CITY OF SAN DIEGO

M E M O R A N D U M

DATE: August 20, 2010

TO: Yousef Ibrahim, Associate Civil Engineer, Engineering and Capital Projects Department, Architectural Engineering and Parks Division

FROM: Jeff Jones, 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 Results for Fire Station 17

Per your request, I have inspected the Fire Station 17 for lead and asbestos on 8/4/10.

Asbestos was found during this inspection and/or previous inspections in the following materials:
Floor tile and mastic located under carpet throughout Dorm and Bullpen area
Window putty on windows throughout the structure
Baseboard mastic throughout the Dorm and Bullpen area
Roof penetration mastic

The table below shows all samples collected and their results:

Sample #	Material	Location	Condition	% Asbestos
6499-1A	Floor tile and mastic	Dorm	good	>1%
6499-2A	Floor tile and mastic	Bullpen	good	2%
6499-3A	Wallboard	Dorm	good	ND
6499-3B	Wallboard	Bullpen	good	ND
6499-4A	Ceiling tile	Dorm	good	ND
6499-4B	Ceiling tile	Bullpen	good	ND
6499-5A	Baseboard Mastic	Dorm	good	< 1%
6499-5B	Baseboard Mastic	Bullpen	good	ND
6499-6A	Black roof mastic	Roof	good	3%
6491-1	Exterior stucco	Exterior	good	ND
6491-2	Interior plaster	Kitchen	good	ND

Any work that disturbs the asbestos materials must be performed by an asbestos abatement contractor. It's recommended to remove the asbestos materials prior to demolition.

Lead is present in levels above threshold concentrations on exterior metal window surfaces. Threshold concentrations are levels of lead where if it is disturbed during renovations,

maintenance, or repairs, exposure to lead may occur. Such operations must be performed by lead certified workers.

All painted components and paint chips intended for disposal must have a waste characterization performed, or they must be assumed hazardous. If various components are consolidated into one trash receptacle then composite samples from the trash in that receptacle can be collected and the results can represent the entire contents of the receptacle.

Complete asbestos lab results, and lead XRF results are attached to this memo.

If there are any questions regarding this memo, please call me at (858) 573-1277 or email at jjones@sandiego.gov. Please let me know if you need a cost estimate for the removal of any asbestos and lead materials.

Jeff Jones
Asbestos and Lead Program Inspector

Attachments: Asbestos lab results
Lead XRF results

memo2010\1423

Report No:	139658	**Customer:**	City of San Diego 9601 Ridgehaven Ct. #320 San Diego, CA 92123
Date:	August 18, 2010		
Date Received:	August 12, 2010		
Date Analyzed:	August 18, 2010	**Attention:**	Jeff Jones
Date/Time Collected:	by Jeff Jones	**Reference:**	Project#6491
Subject:	Polarized Light Microscopy Analysis for Asbestos	15	Samples
Methodology:	"Method for Determination of Asbestos in Bulk Building Materials." (EPA 600/R-93/116 & EPA-600/M4-82-020)		
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	Asbestos	Percent in Layer
1A FLOOR TILE		
Layer: Tan Granular		Chrysotile (Greater than 1%)
Asbestos Composite Value:	Chrysotile (Greater than 1%)	
Friability: Non-Friable		
Other Fibrous Material: ND		
1A MASTIC		
Layer: Black Tar Like		Chrysotile (2%)
Asbestos Composite Value:	Chrysotile (2%)	
Friability: Non-Friable		
Other Fibrous Material: ND		
1B FLOOR TILE	NOT ANALYZED - STOP AT FIRST POSITIVE	
1B MASTIC	NOT ANALYZED - STOP AT FIRST POSITIVE	
1C FLOOR TILE	NOT ANALYZED - STOP AT FIRST POSITIVE	
1C MASTIC	NOT ANALYZED - STOP AT FIRST POSITIVE	
2A		
Layer: Brown Paint, Tan Granular		Chrysotile (1-2%)
Asbestos Composite Value:	Chrysotile (1-2%)	
Friability: Non-Friable		
Other Fibrous Material: ND		
2B	NOT ANALYZED - STOP AT FIRST POSITIVE	
3A		
Layer: White Granular, Brown I White		ND
Asbestos Composite Value:	Asbestos (ND)	
Friability: Non-Friable		
Other Fibrous Material: Cellulose (10%) Fiberglass (<1%)		
3B		
Layer: White Granular, Brown I White		ND
Asbestos Composite Value:	Asbestos (ND)	
Friability: Non-Friable		
Other Fibrous Material: Cellulose (10%)		

Report No: 139658 **Customer:** City of San Diego

Sample ID	Asbestos Type	Percent in Layer
4A		
Layer: WhitePaint, Gray Fibrous		ND
Asbestos Composite Value:	Asbestos (ND)	
Friability: Non-Friable		
Other Fibrous Material: Cellulose (40%) Glasswool (30%)		
4B		
Layer: WhitePaint, Gray Fibrous		ND
Asbestos Composite Value:	Asbestos (ND)	
Friability: Non-Friable		
Other Fibrous Material: Cellulose (40%) Glasswool (30%)		
5A		
Layer: Gray Granular, Brown Solid		Chrysotile (Less than 1%)
Asbestos Composite Value:	Chrysotile (Less than 1%)	
Friability: Non-Friable		
Other Fibrous Material: Glasswool (<1%) Clv. Fragmt (1%)		
5B		
Layer: Gray Granular, Brown Solid		Anthophylite (Less than 1%)
Asbestos Composite Value:		
Friability: Non-Friable	Anthophylite (Less than 1%)	
Other Fibrous Material: Clv. Fragmt (1%)		
6A		
Layer: White Fibrous, Black Tar Like		Chrysotile (3%)
Asbestos Composite Value:	Chrysotile (3%)	
Friability: Non-Friable		
Other Fibrous Material: ND		

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.

EMS LABORATORIES 117 West Bellevue Drive / Pasadena CA 91105-2503 /626-568-4065

139658

SUBMITTAL FORM/*Laboratory Services*

PAGE 1 OF 1

3 day T/A

RELINQUISHED BY Jeff Jones
TIME / DATE 8/11/10

CLIENT City of San Diego
ADDRESS 9601 Ridgehaven Ct. #320
San Diego, CA 92123
TELEPHONE 858-573-1277
CONTACT Jeff Jones

DATE OF SHIPMENT ____ CARRIER FedEx
CLIENT P.O. NO. 1078974
CLIENT JOB/PROJECT ID NO(S). 6491
PACKAGE SHIPPED FROM San Diego

RESULTS REQUESTED VIA Email: jjones@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
SAMPLE PRESERVATIVES ____ HOLDING TIMES
NO. OF SAMPLES SENT 13 SAMPLER'S NAME ____ Jeff Jones
(SIGNATURE) (PRINTED)

TYPE: ☐ WATER ☐ WASTE WATER ☐ SOIL ☐ FILTER ☐ SORBENT TUBE ☐ IMPINGER ☐ OTHER

(FOR EMS ONLY) EMS Sample No.	CLIENT SAMPLE NO.	DESCRIPTION/LOCATION/ANALYSIS		VOLUME/ TIME/WEIGHT (IF APPLICABLE)
139658-1A	1A	Floor tile and black mastic	PLM	
139658-1B	1B	Floor tile and black mastic		
139658-1C	1C	Floor tile and black mastic	stop pos	
139658-2A	2A	Window putty		
139658-2B	2B	Window putty	stop pos	
139658-3A	3A	Drywall/mud composite		
139658-3B	3B	Drywall/mud composite	stop pos	
139658-4A	4A	Ceiling tile		
139658-4B	4B	Ceiling tile	stop pos	
139658-5A	5A	Baseboard mastic		
139658-5B	5B	Baseboard mastic	stop pos	
139658-6A	6A	Roof mastic		
139658-6B	6B	Roof mastic	stop pos	

(SF 5/00)

FOR EMS ONLY

Laboratory No. 139658
Received By [illegible] Time 9:22
Date of Package Delivery 8/12/10
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 13
Chain-of-Custody Signature
Date of Acceptance into Sample Bank 8/12/10
Misc. Info.
Disposition of Samples EMS Labs

EMS LABORATORIES 117 West Bellevue Drive / Pasadena CA 91105-2503 / 626-568-4065

City of San Diego/Asbestos and Lead Management Program

Project 6499 Fire Station 17

XRF Assay Results

Reading No	Time	Duration	Inspector	Site	Room	Side	Component	Substrate	Condition	Color	PbC	PbC Error
1	6/29/2010 10:24	128.66									3.32	0
2	6/29/2010 10:26	6.03	rc	229			calibration			red	0.9	0.1
3	6/29/2010 10:26	8.23	rc	229			calibration			red	1	0.1
4	6/29/2010 10:27	11.79	rc	229			calibration			red	1	0.1
5	6/29/2010 10:28	22.03	rc	229			calibration			red	1	0.1
10	6/29/2010 10:31	1.56	rc	229	kitchen	B	wall	plaster	intact	white	0	0.02
12	6/29/2010 10:35	2.01	rc	229	bay	A	wall	plaster	intact	tan	0	0.02
14	6/29/2010 10:35	2.66	rc	229	bay	C	wall	plaster	intact	tan	0	0.02
15	6/29/2010 10:36	1.56	rc	229	bay	A	door	wood	intact	tan	0.01	0.04
16	6/29/2010 10:36	1.56	rc	229	bay	A	door fr	wood	intact	tan	0	0.02
17	6/29/2010 10:37	2.46	rc	229	bullpen	A	ceiling	plaster	intact	tan	0.02	0.03
18	6/29/2010 10:37	2	rc	229	bullpen	A	ceiling	plaster	intact	tan	0.05	0.02
19	6/29/2010 10:38	1.56	rc	229	bullpen	A	ceiling	plaster	intact	tan	0.02	0.05
22	6/29/2010 10:38	0.44	rc	229	bullpen	A	door fr	wood	intact	tan	0.01	0.06
23	6/29/2010 10:39	1.34	rc	229	dorm	A	door	wood	intact	tan	0	0.02
24	6/29/2010 10:39	1.34	rc	229	dorm	A	door fr	wood	intact	tan	0	0.02
25	6/29/2010 10:40	2.66	rc	229	dorm	B	wall	plaster	intact	tan	0	0.02
26	6/29/2010 10:40	2.68	rc	229	dorm	C	wall	plaster	intact	tan	0.03	0.06
27	6/29/2010 10:40	1.79	rc	229	dorm	D	wall	plaster	intact	tan	0	0.02
28	6/29/2010 10:40	1.34	rc	229	dorm	D	wall	plaster	intact	tan	0	0.02
29	6/29/2010 10:44	2.66	rc	229	outside	A	wall	stucco	intact	tan	0.01	0.03
30	6/29/2010 10:44	3.57	rc	229	outside	A	wall	stucco	intact	tan	0	0.02
31	6/29/2010 10:44	3.09	rc	229	outside	b	wall	stucco	intact	tan	0	0.02
32	6/29/2010 10:45	2.44	rc	229	outside	c	wall	stucco	intact	tan	0.01	0.04
33	6/29/2010 10:45	3.55	rc	229	outside	c	wall	stucco	intact	tan	0.01	0.02
34	6/29/2010 10:46	1.56	rc	229	outside	d	window	metal	intact	tan	0.4	0.2
35	6/29/2010 10:46	1.56	rc	229	outside	d	window	metal	intact	tan	0.3	0.2
37	6/29/2010 14:19	14.43	rc				calibration			red	1.1	0.1
38	6/29/2010 14:20	9.12	rc				calibration			red	0.9	0.1
39	6/29/2010 14:20	9.08	rc				calibration			red	1	0.1

APPENDIX J

SAMPLE OF PUBLIC NOTICES

CONSTRUCTION NOTICE

PROJECT NAME

Trenching on your street is complete.

What you need to know:

- Pipe installation on your street is complete and construction crews are now installing new pipeline for this project at another location.
- You may see temporary trench plates or trench caps for some time –even after construction activities have concluded on your street.

Street resurfacing:

- Your Streets will be resurfaced once the entire pipeline project is complete.
- Concrete streets will not be resurfaced curb to curb; only the trench will be backfilled.
- Street resurfacing may be delayed due to the City's slurry seal moratorium.

Estimated resurfacing completion on your street:

(Insert Date-Month and Year)

For questions related to this work

Call: **(619) 533-4207**

Email: **engineering@sandiego.gov**

Visit: **sandiego.gov/CIP**

CITY OF SAN DIEGO
PUBLIC WORKS
DEPARTMENT

This information is available in alternative formats upon request.

ATTACHMENT F

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LIC. B (1)
(JG)

City of San Diego

CONTRACTOR'S NAME: EC Constructors, Inc.
ADDRESS: 9834 River Street, Lakeside, CA, 92040
TELEPHONE NO.: (619) 440-7181 FAX NO.: (619) 440-7180
CITY CONTACT: Eleida Felix Yackel, Contract Specialist, Email: EFelixYackel@sandiego.gov
Phone No. (619) 533-3449, Fax No. (619) 533-3633
R. Jadan / A. James / LJI

CONTRACT DOCUMENTS

FOR

FIRE STATION NO. 17

VOLUME 2 OF 2

BID NO.: **K-16-6142-DBB-3**
SAP NO. (WBS/IO/CC): **S-00783**
CLIENT DEPARTMENT: **1912**
COUNCIL DISTRICT: **9**
PROJECT TYPE: **BC**

THIS CONTRACT IS SUBJECT TO THE FOLLOWING:

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

THIS BIDDING DOCUMENT TO BE SUBMITTED IN ITS ENTIRETY
REFER TO VOLUME 1 COVER PAGE FOR TIME, DATE, AND LOCATION

TABLE OF CONTENTS

DESCRIPTION **PAGE NUMBER**

Volume 2 - Bidding Documents

The following forms must be completed in their entirety and submitted with the Bid. Include the form(s) even if the information does not apply. Where the information does not apply write in N/A. Failure to include any of the forms may cause the Bid to be deemed **non-responsive.** If you are uncertain or have any questions about any required information, contact the City no later than 14 days prior to Bid due date.

PROPOSAL

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.

IF A SOLE OWNER OR SOLE CONTRACTOR SIGN HERE:

(1) Name under which business is conducted N/A

(2) Signature (Given and surname) of proprietor _____

(3) Place of Business (Street & Number) _____

(4) City and State _____ Zip Code _____

(5) Telephone No. _____ Facsimile No. _____

(6) Email Address _____

IF A PARTNERSHIP, SIGN HERE:

(1) Name under which business is conducted N/A

(2) Name of each member of partnership, indicate character of each partner, general or special (limited):

_____

_____

(3) Signature (Note: Signature must be made by a general partner)

_____

Full Name and Character of partner

_____

_____

(4) Place of Business (Street & Number) _____

(5) City and State _____ Zip Code _____

(6) Telephone No. _____ Facsimile No. _____

(7) Email Address _____

IF A CORPORATION, SIGN HERE:

(1) Name under which business is conducted EC Constructors, Inc.

(2) Signature, with official title of officer authorized to sign for the corporation:

_____
(Signature)

Sherri L. Summers
(Printed Name)

CEO
(Title of Officer)

(Impress Corporate Seal Here)

(3) Incorporated under the laws of the State of California

(4) Place of Business (Street & Number) 9834 River Street

(5) City and State Lakeside, CA Zip Code 92040

(6) Telephone No. (619) 440-7181 Facsimile No. (619) 440-7180

(7) Email Address jim@ecconstructors.com

THE FOLLOWING SECTIONS MUST BE FILLED IN BY ALL PROPOSERS:

In accordance with the "**NOTICE INVITING BIDS**", the bidder holds a California State Contractor's license for the following classification(s) to perform the work described in these specifications:

LICENSE CLASSIFICATION B & C8

LICENSE NO. 585677 EXPIRES 2/29/16

DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) REGISTRATION NUMBER:

1000004249

This license classification must also be shown on the front of the bid envelope. Failure to show license classification on the bid envelope may cause return of the bid unopened.

TAX IDENTIFICATION NUMBER (TIN): [redacted]

Email Address: jim@ecconstructors.com

THIS PROPOSAL MUST BE NOTARIZED BELOW:

I certify, under penalty of perjury, that the representations made herein regarding my State Contractor's license number, classification and expiration date are true and correct.

Signature Sherri L. Summers Title CEO

SUBSCRIBED AND SWORN TO BEFORE ME, THIS _____ DAY OF _____, _____.

Notary Public in and for the County of _____, State of _____

CA Jurat Attached

(NOTARIAL SEAL)

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

State of California
County of San Diego

Subscribed and sworn to (or affirmed) before me on this 15th day of October, 20 15, by Sherri L. Summers

_____,

proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

CHRISTINE LARSEN
Commission # 2055775
Notary Public - California
San Diego County
My Comm. Expires Jan 24, 2018

(Seal)

Signature _____

BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That EC Constructors, Inc. as Principal, and

Hartford Fire Insurance Company 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. 17

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 16th day of October, 20 15

EC Constructors, Inc. (SEAL)	Hartford Fire Insurance Company (SEAL)
(Principal)	(Surety)
By: _____	By: _____
(Signature) Sherri L. Summers, CEO	(Signature) Charlotte Aquino, Attorney-in-Fact

(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 San Diego }

On OCT 16 2015 (Date) before me, John Richard Flores JR. (Insert Name of Notary exactly as it appears on the official seal), Notary Public,

personally appeared Charlotte Aquino (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.

Signature _____ (Signature of Notary Public) John Richard Flores JR.

JOHN RICHARD FLORES JR.
COMM. #2036097
Notary Public - California
San Diego County
My Comm. Expires Aug. 8, 2017
NRO1 NRO1

Place Notary Seal Above

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of the form to another 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: _____
- ☐ Individual
- ☐ Corporate Officer — Title(s): _____
- ☐ Partner ☐ Limited ☐ General
- ☑ Attorney in Fact
- ☐ Trustee
- ☐ Guardian or Conservator
- ☐ Other: _____

Signer is Representing:
Surety Company

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

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

Signer is Representing:

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

POWER OF ATTORNEY

Direct Inquiries/Claims to:
THE HARTFORD
BOND, T-4
One Hartford Plaza
Hartford, Connecticut 06155
call: **888-266-3488** *or fax:* **860-757-5835**

KNOW ALL PERSONS BY THESE PRESENTS THAT: **Agency Code: 72-160200**

- [X] **Hartford Fire Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- [X] **Hartford Casualty Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Accident and Indemnity Company**, a corporation duly organized under the laws of the State of Connecticut
- [ ] **Hartford Underwriters Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- [ ] **Twin City Fire Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Insurance Company of Illinois**, a corporation duly organized under the laws of the State of Illinois
- [ ] **Hartford Insurance Company of the Midwest**, a corporation duly organized under the laws of the State of Indiana
- [ ] **Hartford Insurance Company of the Southeast**, a corporation duly organized under the laws of the State of Florida

having their home office in Hartford, Connecticut, (hereinafter collectively referred to as the "Companies") do hereby make, constitute and appoint, ***up to the amount of unlimited:***

Lawrence F. McMahon, James Baldassare Jr., Sarah Myers, Maria Guise, Lilia Robinson, Charlotte Aquino, Jennifer L. Clampert, Janice Martin
of
San Diego, CA

their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign its name as surety(ies) only as delineated above by ☒, and to execute, seal and acknowledge any and all bonds, undertakings, contracts and other written instruments 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, and as authorized by a Resolution of the Board of Directors of the Companies on August 1, 2009 the Companies have caused these presents to be signed by its Vice President and its corporate seals to be hereto affixed, duly attested by its Assistant Secretary. Further, pursuant to Resolution of the Board of Directors of the Companies, the Companies hereby unambiguously affirm that they are and will be bound by any mechanically applied signatures applied to this Power of Attorney.

Wesley W. Cowling, Assistant Secretary

M. Ross Fisher, Vice President

STATE OF CONNECTICUT }
COUNTY OF HARTFORD } ss. Hartford

On this 12th day of July, 2012, before me personally came M. Ross Fisher, to me known, who being by me duly sworn, did depose and say: that he resides in the County of Hartford, State of Connecticut; that he is the Vice President of the Companies, the corporations described in and which executed the above instrument; that he knows the seals of the said corporations; that the seals affixed to the said instrument are such corporate seals; that they were so affixed by authority of the Boards of Directors of said corporations and that he signed his name thereto by like authority.

Kathleen T. Maynard
Notary Public
My Commission Expires July 31, 2016

CERTIFICATE

I, the undersigned, Vice President of the Companies, 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 still in full force effective as of OCT 16 2015
Signed and sealed at the City of Hartford.

Gary W. Stumper, Vice President

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)

) ss.

County of San Diego)

Sherri L. Summers, being first duly sworn, deposes and says that he or she is CEO of 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.

Signed: _____

Title: Sherri L. Summers, CEO

Subscribed and sworn to before me this _____day of_____,20___

_____

Notary Public

(SEAL)

CA Jurat Attached

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

State of California
County of San Diego

Subscribed and sworn to (or affirmed) before me on this 15th day of October, 20 15, by Sherri L. Summers,
proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

CHRISTINE LARSEN
Commission # 2055775
Notary Public - California
San Diego County
My Comm. Expires Jan 24, 2018

Seal

Signature

CONTRACTORS 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: EC Constructors, Inc.

Certified By Sherri L. Summers Title CEO

Name

Signature Date 10-14-15

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
Phone (619) 533-3948 Fax (619) 533-3220

COMPANY INFORMATION

Company Name: EC Constructors, Inc.	Contact Name: Jim Summers
Company Address: 9834 River Street	Contact Phone: (619) 440-7181
Lakeside, CA 92040	Contact Email: jim@ecconstructors.com

CONTRACT INFORMATION

Contract Title: Fire Station #17 City of San Diego	Start Date: 12/1/15
Contract Number (if no number, state location): K-16-6142-DBB-3	End Date: 8/14/17

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.

Sherri L. Summers, CEO	Sherri L Summers	10-14-15
Name/Title of Signatory	Signature	Date

FOR OFFICIAL CITY USE ONLY

Receipt Date: EBO Analyst: ☐ Approved ☐ Not Approved – Reason:

(Rev 02/15/2011)

PROPOSAL (BID)

The Bidder agrees to the construction of **FIRE STATION NO. 17** for the City of San Diego, in accordance with these contract documents for the prices listed below. 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 to Award of the Contract. 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 e.g., bond and insurance.

Item	Quantity	Unit	NAICS	Payment Reference	Description	Unit Price	Extension
BASE BID							
1	1	LS	236220	Tech. Spec/ Plans	Construction of Fire Station No. 17 and Related Site Improvements, including but not limited to Photo Voltaic Roof System, and Demolition the existing Fire Station at 4206 Chamoune Ave, San Diego, CA, 92115		$5,666,188.00 ~~$5,699,850~~
2	1	LS	236220	Tech. Spec/ Plans	Fire Station No. 17 Temporary Facility at 4000 41st St., San Diego CA, 92115		$674,202.00
3	1	AL	236220	7-5.3	Building Permits for Permanent and Temporary Station: Mechanical, Plumbing and Electrical and Fees Related to Fuel Tank Permit,including City of San Diego, Water & SewerCapacities and Connection Fees - Type I		$100,000.00
4	1	AL	238210	Tech. Spec/ Plans	SDG&E Service Fee, Dry Utilities Connections, Pack Bell, AT&T and Time Warner - Type I		$70,000.00
5	1	AL	236220	Tech. Spec/ Plans	FF & E (Temporary and Permanent Facilities) - Type I		$120,000.00
6	1	LS	524126	2-4.1	Bond (Payment and Performance)		$ 74,480.00
7	1	LS	237990	701-13.9.5	Water Pollution Control Program Implementation		$ 29,733.00
8	1	LS	236220	701-13.9.5	Water Pollution Control Program Development		$ 1,306.00
9	1	AL		9-3.5	Field Orders - Type II		$350,000.00
						TOTAL BASE BID:	$7,085,909.00

TOTAL BID PRICE FOR BID (Items 1 through 9 inclusive) amount written in words:

Seven Million Eighty Five Thousand Nine Hundred Nine Dollars + 00/100

The Bidder is to acknowledge within the bid the receipt of any addenda that were issued. If an addendum was issued by the City and not acknowledged by the Bidder, the bid may be deemed non-responsive. The following addenda have been received and are hereby acknowledged: _

Addenda A & B & C

The names of all persons interested in the foregoing proposal as principals are as follows:

James J. Summers, President

Sherri L. Summers, CEO

IMPORTANT NOTICE: If Bidder or other interested person is a corporation, state secretary, treasurer, and manager thereof; if a co-partnership, state true name of firm, also names of all individual co-partners composing firm; if Bidder or other interested person is an individual, state first and last names in full.

Bidder: EC Constructors, Inc.

Title: Sherri L. Summers, CEO

Business Address: 9834 River Street

Place of Business: Lakeside, CA

Place of Residence: Alpine, CA

Signature: Sherri L Summers

NOTES:

A. The City shall determine the low Bid based on the Base Bid alone.

B. Prices and notations shall be in ink or typewritten. All corrections (which have been initiated by the Bidder using erasures, strike out, line out, or "white-out") shall be typed or written in with ink adjacent thereto, and shall be initialed in ink by the person signing the bid proposal.

C. Failure to initial all corrections made in the bidding documents may cause the Bid to be rejected as **non-responsive** and ineligible for further consideration.

D. Blank spaces must be filled in, using figures. Bidder's failure to submit a price for any Bid item that requires the Bidder to submit a price shall render the Bid **non-responsive** and shall be cause for its rejection.

E. Unit prices shall be entered for all unit price items. Unit prices shall not exceed two (2) decimal places. If the Unit prices entered exceed two (2) decimal places, the City will only use the first two digits after the decimal points without rounding up or down.

F. All extensions of the unit prices bid will be subject to verification by the City. In the case of inconsistency or conflict between the product of the Quantity x Unit Price and the Extension, the product shall govern.

G. In the case of inconsistency or conflict, between the sums of the Extensions with the estimated total Bid, the sum of the Extensions shall govern.

H. Bids shall not contain any recapitulation of the Work. Conditional Bids will be rejected as being **non-responsive**. Alternative proposals will not be considered unless called for.

I. Subcontractors' License Number must be filled in. Failure to provide the information specified may deem the bidder **non-responsive**.

LIST OF SUBCONTRACTORS

In accordance with the requirements of the "Subletting and Subcontracting Fair Practices Act", Section 4100, of the California Public Contract Code (PCC), the Bidder is to list below the name, address and license number of each Subcontractor who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement, in an amount of or in excess of 0.5% of the Contractor's total Bid. Failure to comply with this requirement may result in the Bid being rejected as non-responsive. The Contractor is to list only one Subcontractor for each portion of the Work. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percentage of the Work to be performed with the Bidder's own forces. The Bidder is to also list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which the Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER & DIR NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED ②	CHECK IF JOINT VENTURE PARTNERSHIP
Name: Construction Testing & Engineering, Inc. Address: 1441 Montiel Road, Suite 115 City: Escondido State: CA Zip: 92026 Phone: 760-746-4955 Email: blaine@cte-inc.net	Testing	N/A DIR# 1000006116	Testing & Inspection	$55,000.00	N/A		
Name: William A. Steen & Associates Address: 8580 La Mesa Blvd. Suite 102 City: La Mesa State: CA Zip: 91942-9597 Phone: 619-460-9000 Email: mabbamonte@wasteen.com	Survey	RCE 18136 DIR# 1000009420	Survey	$13,024.00	ELBE	CITY	

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Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC	San Diego Regional Minority Supplier Diversity Council	SRMSDC
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

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Name: Anton's Service Address: P.O. Box 455 City: Lakeside State: CA Zip: 92040 Phone: 619-579-9000 Email: steve@antonservice.com	constructor	Lic# 861069 DIR#1000002533	Demolition	$80,467.00	SLBE	CITY	
Name: Cats Excavating, Inc. Address: 1944 54th Street City: San Diego State: CA Zip: 92105 Phone: 619-843-7086 Email: jthompson@CatsExcavating.com	constructor	Lic# 790422 DIR# 1000025409	Earthwork	$76,004.00	ELBE	CITY	

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Name: Quality Reinforcing, Inc. Address: 13275 Gregg Street City: Poway State: CA Zip: 92064 Phone: 858-748-8400 Email: aaragon@qualityreinforcing.com	constructor	Lic# 683317 DIR# 1000000742	Rebar	$56,517.00	N/A		
Name: Amigo's Landscapes Address: 8617 Cuyamaca St. City: Santee State: CA Zip: 92071 Phone: 619-749-9530 Email: estimating@amigoslandscapes.com	constructor	Lic# 983654 DIR# 1000009130	Landscape	$107,484.00	ELBE	CITY	

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Name: William & Sons Masonry, Inc. Address: 13780 Highway 8 Business City: El Cajon State: CA Zip: 92021 Phone: 619-443-1751 Email: darin@sons.sdcoxmail.com	constructor	Lic# 480899 DIR# 1000001088	Masonry	$341,304.00	N/A		
Name: Minshew Brothers Steel Construction Address: 12578 Vigilante Road City: Lakeside State: CA Zip: 92040 Phone: 619-561-5700 Email: gary@minshewsteel.com	constructor	Lic# 677945 DIR# 1000005496	Structural Steel & Metal Deck	$490,945.00	N/A		

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Name: Custom Laminated Plastics, Inc. Address: 7355 Carroll Road City: San Diego State: CA Zip: 92121 Phone: 858-689-8386 Email: djpedersen@sbcglobal.net	constructor	Lic# 523523 DIR# 1000018867	Casework	$130,000.00	N/A		
Name: Address: City: State: Zip: Phone: Email:							

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Name: GLS Spray Services Address: 12125 Kear Place, Suite B City: Poway State: CA Zip: 92064 Phone: 858-668-3334 Email: mike@glsspray.com	constructor	Lic# 535326 DIR# 1000008739	Fireproofing	$120,500.00	N/A		
Name: Johnson Finch & McClure Address: 9749 Cactus Street City: Lakeside State: CA Zip: 92040 Phone: 619-936-9727 Email: GGarcia@jfmcon.com	constructor	Lic# 392277 DIR# 1000004431	Insulation	$36,765.00	N/A		

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Name: Sylvester Roofing Co, Inc. Address: 306 West El Norte Pkwy, Ste N City: Escondido State: CA Zip: 92026 Phone: 760-743-0048 Email: tony@sylvesterroofing.com	constructor	Lic# 516696 DIR# 1000006357	Roofing	$55,482.00	N/A		
Name: Challenger Sheet Metal Address: 9353 Abraham Way City: Santee State: CA Zip: 92071 Phone: 858-547-8040 Email: sean@challengersm.com	constructor	Lic# 525782 DIR# 1000001937	Sheet Metal & Wall Panels	$268,395.00	N/A		

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Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
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Name: Inland Overhead Door Co. Address: 12401 S. La Cadena Drive City: Colton State: CA Zip: 92324 Phone: 909-783-3131 Email: ryan@iodc.com	constructor	Lic# 492369 DIR# 1000017098	Overhead Doors	$53,400.00	N/A		
Name: Southwest Door & Frame, Inc. Address: 6251 Shaefer Avenue, Suite B City: Chino State: CA Zip: 91710 Phone: 909-465-6705 Email: matt@swi-ca.com	constructor	Lic# 866133 DIR# 1000004854	Doors & Hardware	$77,695.00	N/A		

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Name: Centex Glazing Address: 8260 Commercial Street City: La Mesa State: CA Zip: 91942 Phone: 619-644-1981 Email: fredwitte@centexglazing.com	constructor	Lic# 806989 DIR# 1000005393	Glazing	$160,864.00	N/A		
Name: Address: City: State: Zip: Phone: Email:							

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Name: E.L. Hobbs, Inc. Address: P.O. Box 966 City: El Cajon State: CA Zip: 92020 Phone: 619-401-1708 Email: ehobbs@elhobbsinc.com	constructor	Lic# 777073 DIR# 1000004428	Gypsum Board & Lath/Plaster	$495,000.00	ELBE	CITY	
Name: Address: City: State: Zip: Phone: Email:							

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Name: Tile/Marble Technology Address: 11211 Sorrento Valley Rd. Suite N City: San Diego State: CA Zip: 92121 Phone: 858-452-8682 Email: TMTScott@aol.com	constructor	Lic# 641825 DIR# 1000006173	Tile	$67,100.00	N/A		
Name: Pro Spectra Contract Flooring Address: 8320 Camino Santa few. Ste 1 City: San Diego State: CA Zip: 92121 Phone: 858-642-7429 Email: ton.wurth@spectracf.com	constructor	Lic# 740392 DIR# 1000002810	Resilient Flooring	$39,350.00	N/A		

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Name: Wood and Son Painting Address: 9932 Maine Ave. City: Lakeside State: CA Zip: 92040 Phone: 619-938-9900 Email: woodandsonpainting@yahoo.com	constructor	Lic# 725086 DIR# 1000017072	Painting	$37,000.00	N/A		
Name: Kone, Inc. (SD Office) Address: 9850 Businesspark Avenue City: San Diego State: CA Zip: 92131 Phone: 562-577-7535 Email: tucker.loomis@kone.com	constructor	Lic# 179166 DIR# 1000003806	Elevators	$150,000.00	N/A		

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Name: Millenium Fire Protection Corp. Address: 101 Copperwood Way, Ste H City: Oceanside State: CA Zip: 92058 Phone: 760-722-2722 Email: mwhittaker@mfpc.us	constructor	Lic# 869040 DIR# 1000003558	Fire Sprinklers	$57,200.00	N/A		
Name: RRL Heating & Air Conditioning Address: 2902 Mobley St. City: San Diego State: CA Zip: 92123 Phone: 619-850-3532 Email: RRLMECH@GMAIL.COM	constructor	Lic# 977497 DIR# 1000015881	HVAC	$262,500.00	N/A		

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Name: R&M Plumbing Contractors, Inc. Address: 8825 Diamond Back Drive City: Santee State: CA Zip: 92071 Phone: 619-504-6520 Email: randmplumbing@cox.net	constructor	Lic# 956104 DIR# 1000005905	Plumbing & Underground Utilities	$351,000.00	SLBE	CITY	
Name: Precision Electric Company Address: 8137 Winter Gardens Blvd. City: Lakeside State: CA Zip: 92040 Phone: 619-966-9652 Email: sky@precisionelectricsolar.com	constructor	Lic# 534116 DIR# 1000002037	PV System (Solar)	$43,300.00	N/A		

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Name: Robinson Electric Address: 8871 Troy Street City: Spring Valley State: CA Zip: 91977-2638 Phone: 619-697-6040 Email: drewr@robinsonelectric.com	constructor	Lic# 429995 DIR# 1000000402	Electrical	$416,700.00	N/A		
Name: Time & Alarm Systems Address: 9260 Isaac St. Suite D City: Santee State: CA Zip: 92071 Phone: 858-277-7877 Email: sstreeter@timeandalarm.com	constructor	Lic# 393251 DIR# 1000000832	Fire Alarm	$62,000.00	N/A		

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Name: AAIR Purification Systems Address: 9040 Kenamar Drive, Ste 402 City: San Diego State: CA Zip: 92121 Phone: 858-578-2825 Email: airpurisys@aol.com	constructor	Lic# 621360 DIR# 1000030031	Vehicle Exhaust	$58,273.00	N/A		
Name: Power Plus Address: 1005 N. Edward Court City: Anaheim State: CA Zip: 92806 Phone: 714-507-1881 Email: jdowning@powerplus.com	constructor	Lic# 980589 DIR# 1000000774	Temporary Electrical	$44,335.00	N/A		

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NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTION OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER & DIR NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED ②	CHECK IF JOINT VENTURE PARTNERSHIP
Name: Construction Testing & Engineering, Inc. Address: City: Escondido State: CA Zip: Phone: Email:	Testing	N/A 1000006116	Testing & Inspection				
Name: William A. Steen & Associates Address: City: La Mesa State: CA Zip: Phone: Email:	Survey	RCE 18136 1000009420	Survey	$13,024.00	ELBE	CITY	

① As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC	San Diego Regional Minority Supplier Diversity Council	SRMSDC
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

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Name: Anton's Service Address: City: Lakeside State: CA Zip: Phone: Email:	constructor	861069 1000002533	Demolition	80,467-	SLBE	CITY	
Name: Cats Excavating Address: City: San Diego State: CA Zip: Phone: Email:	constructor	790422 1000025409	Earthwork	76,004-	SLBE	CITY	

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Name: Quality Address: City: Poway State: CA Zip: Phone: Email:	constructor	683317 1000000742	Rebar				
Name: Amigos Address: City: Santee State: CA Zip: Phone: Email:	constructor	983654 1000009130	Landscape	107,484-	SLBE	CITY	

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Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
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Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
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State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

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Name: William & Sons Address: City: El Cajon State: CA Zip: Phone: Email:	constructor	480899 ~~15~~ A. 1000001088	Masonry				
Name: Address: City: State: Zip: Phone: Email:							

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Name: Minshew Bros. Address: City: Lakeside State: CA Zip: Phone: Email:	constructor	677945 1000005496	Structural Steel + Metal Deck				
Name: Address: City: State: Zip: Phone: Email:	N.A. ~~constructor~~		N.A. ~~Metal Deck~~				

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Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
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Name: Custom Laminated Plas. Address: City: San Diego State: CA Zip: Phone: Email:	constructor	523523 1000018867	CASEWORK				
Name: Arce Custom Cabinets, Inc. Address: City: Lakeside State: CA Zip: Phone: Email:	constructor	930618 1000005414	Casework	$145,860.00	SLBE	CITY	

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Name: GLS Spray Services Address: City: Poway State: CA Zip: Phone: Email:	constructor	535326 1000008739	Fireproofing				
Name: Johnson, Finch & McClure Address: City: Lakeside State: CA Zip: Phone: Email:	constructor	392277 1000004431	Insulation				

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Name: Sylvester Address: City: Escondido State: CA Zip: Phone: Email:	constructor	516694 1000006357	Roofing				
Name: Challenger Address: City: Santee State: CA Zip: Phone: Email:	constructor	525782 1000001937	Sheet Metal & Wall Panels				

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Name: Overhead Door Co. Address: City: Colton State: CA Zip: Phone: Email:	constructor	~~492394~~ A.L. 492369 1000001709	Overhead Doors				
Name: Southwest Door Address: City: Chino State: CA Zip: Phone: Email:	constructor	866133 1000004854	Doors & Hardware				

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Name: Centex Glazing Address: City: La Mesa State: CA Zip: Phone: Email:	constructor	806989 1000005393	Glazing				
Name: Address: City: State: Zip: Phone: Email:							

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Name: E.L. Hobbs Address: City: El Cajon State: CA Zip: Phone: Email:	constructor	777073 1000004428	Gypsum Board + Lath & Plaster	495,000-	SLBE	CITY	
Name: Address: City: State: Zip: Phone: Email:	N.A. ~~constructor~~		N.A. ~~Lath & Plaster~~				

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Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC	San Diego Regional Minority Supplier Diversity Council	SRMSDC
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

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Name: TMT Address: City: San Diego State: CA Zip: Phone: Email:	constructor	641835 1000006173	Tile				
Name: Pro Spectra Address: City: San Diego State: CA Zip: Phone: Email:	constructor	740392 1000002810	Resilient Flooring				

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Name: Wood + Son Address: City: LaKeside State: CA Zip: Phone: Email:	constructor	725086 1000017072	Painting				
Name: Kone, Inc. Address: City: Moline State: IL Zip: Phone: Email:	constructor	179166 1000003806	Elevators				

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Name: Millennium Fire Address: City: Oceanside State: CA Zip: Phone: Email:	constructor	869040 1000003558	Fire Sprinklers				
Name: RRL Address: City: San Diego State: CA Zip: Phone: Email:	constructor	977497 1000015881	HVAC				

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Name: R&M Plumbing Contractors, Inc. Address: City: Santee State: CA Zip: Phone: Email:	constructor	956104 1000005905	Plumbing & Underground Utilities	351,000—	ELBE	CITY	
Name: Precision Electric Address: City: Lakeside State: CA Zip: Phone: Email:	constructor	534116 1000002037	PV System (Solar)				

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Name: ~~Precision Electric~~ Robison Electric Address: City: State: Zip: Phone: Email:	constructor A-A		Electrical A.A.				
Name: Time + Alarm Address: City: Santee State: CA Zip: Phone: Email:	constructor	393251 1000000832	Fire Alarm				

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Name: AAIR Purification Systems Address: City: San Diego State: CA Zip: Phone: Email:	constructor	621360 1000030031	Vehicle Exhaust				
Name: Power Plus Address: City: Anaheim State: CA Zip: Phone: Email:	constructor	980589 1000000774	Temporary Electrical				

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Name: Robinson Electric Address: City: Spring Valley State: CA Zip: Phone: Email:	constructor	429995 1000000402	Electrical				
Name: Address: City: State: Zip: Phone: Email:	constructor						

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Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____	constructor						
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Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____	constructor						
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LIST OF SUBCONTRACTORS

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NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER & DIR NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED ②	CHECK IF JOINT VENTURE PARTNERSHIP
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____	constructor						
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____	constructor						

① As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC	San Diego Regional Minority Supplier Diversity Council	SRMSDC
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.

LIST OF SUBCONTRACTORS

In accordance with the requirements of the "Subletting and Subcontracting Fair Practices Act", Section 4100, of the California Public Contract Code (PCC), the Bidder is to list below the name, address and license number of each Subcontractor who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement, in an amount of or in excess of 0.5% of the Contractor's total Bid. Failure to comply with this requirement may result in the Bid being rejected as non-responsive. The Contractor is to list only one Subcontractor for each portion of the Work. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percentage of the Work to be performed with the Bidder's own forces. The Bidder is to also list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which the Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER & DIR NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED ②	CHECK IF JOINT VENTURE PARTNERSHIP
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____	constructor						
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____	constructor						

① As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC	San Diego Regional Minority Supplier Diversity Council	SRMSDC
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.

NAMED EQUIPMENT/MATERIAL SUPPLIER LIST

The Bidder seeking the recognition of equipment, materials, or supplies obtained from Suppliers towards achieving any mandatory, voluntary, or both subcontracting participation percentages is to list the Supplier(s) on the Named Equipment/Material Supplier List. The Named Equipment/Material Supplier List, at a minimum, is to have the name, locations (City) and the **DOLLAR VALUE** of the Suppliers. The Bidder will be credited up to 60% of the amount to be paid to the Suppliers for such materials and supplies unless vendor manufactures or substantially alters materials and supplies in which case 100% will be credited. The Bidder is to indicate (Yes/No) whether listed firm is a supplier or manufacturer. In calculating the subcontractor participation percentages, vendors/suppliers will receive 60% credit of the listed **DOLLAR VALUE**, whereas manufacturers will receive 100% credit. If no indication provided, listed firm will be credited at 60% of the listed dollar value for purposes of calculating the Subcontractor Participation Percentage, Suppliers will receive 60% credit of the listed **DOLLAR VALUE**, whereas manufacturers will receive 100% credit. If no indication provided, listed firm will be credited at 60% of the listed **DOLLAR VALUE** for purposes of calculating the subcontractor participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF VENDOR/SUPPLIER	MATERIALS OR SUPPLIES	DOLLAR VALUE OF MATERIAL OR SUPPLIES (MUST BE FILLED OUT)	SUPPLIER (Yes/No)	MANUFACTURER (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED ②
Name: N/A Address: City: State: Zip: Phone: Email:						
Name: Address: City: State: Zip: Phone: Email:						

① As appropriate, Bidder shall identify Vendor/Supplier as one of the following and shall include a valid proof of certification (except for OBE,SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Vendor/Supplier is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC	San Diego Regional Minority Supplier Diversity Council	SRMSDC
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification

City of San Diego

CITY CONTACT: Eleida Felix Yackel, Contract Specialist,, **Email**: efelixyackel@sandiego.gov
Phone No. (619) 533-3449, **Fax No**. (619) 533-3633

ADDENDUM "A"

FOR

FIRE STATION NO. 17

BID NO.:	**K-16-6142-DBB-3**
SAP NO. (WBS/IO/CC):	**S-00783**
CLIENT DEPARTMENT:	**1912**
COUNCIL DISTRICT:	**9**
PROJECT TYPE:	**BC**

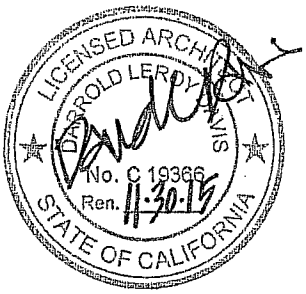
BID DUE DATE:
2:00 PM
OCTOBER 20, 2015
CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
1010 SECOND AVENUE, 14th FLOOR, MS 614C
SAN DIEGO, CA 92101

ENGINEER OF WORK

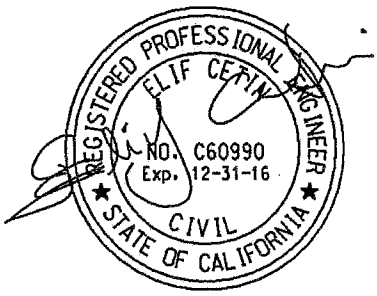
The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Registered Engineer/Architect:

10·7·2015
1) Registered Engineer/Architect — Date — Seal:

CCBG ARCHITECTS INC.



10/8/15
2) For City Engineer — Date — Seal



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

Question pertaining to Terms and Conditions

Q1. According to the attached page from the specs the bidder must self-perform 50% of the work. The next line says the self perform percentage requirement will be waived for contracts when a "B" license is required or allowed. Does that mean if the bidder holds a B license the self perform requirement does not apply?

A1. Yes, that is correct.

Questions pertaining to Scope or Specifications

Q1. Plumbing Plan P0.2 states that Soil, Waste and Vent piping shall be Solid Core PVC DWV Pipe and Solvent Weld Fittings. Specification Section 22 00 00 Part 2.4 states All soil, waste, and vent piping material and fittings within building and within 5 feet of building boundary shall be cast iron, hub less using stainless steel clamps and shield assemblies.

A1. All soil, waste, vent and concealed roof downspout piping within the building and 5 feet beyond the building shall be cast iron, hub less using stainless steel clamps. See Section D, Item 6, of this addendum.

Q2. Drawing page C-3 has alternative 1 and alternative 2 shown. The bid documents do not mention any alternate bid items and do not provide a spec for Old Castle Aqua Roc. Please clarify Aqua Roc and Drivable Grass are equal and either can be used on this project.

A2. Either option with the Aqua Roc or the Drivable Grass paver can be used on this project for the permeable paving areas shown on the Civil sheet but not both. Reminder: that the Drivable Grass paver will not have grass planted topping only the rock.

Q3. Regarding the services of materials testing and deputy special inspection for the above mentioned project, Section 01 45 00, 1.04, A states "Costs for Special Inspection fees will be paid directly by the Owner." How does the City plan to procure these services for this project?

A3. Contractor shall coordinate and pay for special inspections which shall include geotechnical inspection per the geotechnical report and special inspectors. (special inspectors referenced for materials listed on sheet 1 of 166 under "special inspections"). Reimbursement-Payment for these construction special inspectors shall come from bid item #1, referring to Volume 1 (SSP) Special Supplement Provision section 4-1.3.4 which stated special inspection to be paid by the contractor.

Q4. Per spec finishes 09 30 00-3. Part 2 Products. 2.02 tile material, A. General: see color schedule as released by architect and resident engineer forbidding purpose.

Please advise where to locate color schedule.

A4. A general "color schedule" will be created by the Architect during the construction from the Contractors submittals. Color selections have been made on key items already specified. Colors shall typically be selected from specified manufacturer's standard colors unless otherwise noted. See added items in Section D, Item 4, of this addendum.

Q5. Spec section 07 53 16 section 1.01.A.2 has an add alternate for a fully operational, photovoltaic system. Other documents state the PV system is a future project. Please clarify the PV system is not part of this contract.

A5. The Photovoltaic system is part of the base scope in lieu of being an alternate. Technical Specification 07 53 16 section 1.01.A.2 shall read "Fully operational photovoltaic grid-tied, electrical generating system". Contractor shall have a licensed electrical engineer/contractor complete the requirements as a deferred submittal as part of their scope and base bid. See Section D, Item 3 of this addendum

Note: the Architect has worked with the roofing manufacturer to detail the integral non-penetrating membrane PV panel (see Sheet A 5.1) and the layout the number of panels and prep the electrical service entrance section room and system (See Sheet E 0.5) for this type of PV system. Architect will offer backgrounds for these strategic sheets to assist Contractor's team in deferred submittal. Architect has already obtained approval that the wind loads from the proposed PV roofing panels specified comply with the allowable loads of the roofing, roofing substrate, and steel skeleton framing. The roofing manufacturer will assist Contractor's team in coordinating the PV component into the roofing system. The city plan checker would not make final approval of the proposed PV system until the selected licensed contractor/licensed contractors engineer submitted a separate submittal on this specific system.

Q6. Can you confirm and clarify the seismic requirements for the fire alarm system?

A6. The city inspector will be checking that the Fire Alarm panel shall be securely attached to an adequate substrate (screwed to wall studs or wall bracing) so that the main panel cannot easily fall off the wall in the event of a seismic activity.

Q7. Spec section 10 14 00 2.03.C 1., 2. and 3. Call out Exit, Stair and Notice signs, but no sizes are given nor are Room ID and other ADA signs called out. There is no sign schedule in the plans. Will you provide a sign schedule of all signs with their sizes? Sheet A3.1, south Elevation, shows exterior metal letters (CITY OF SAN DIEGO FIRE STATION) but no size is given. What is the size of the metal letters?

A7. It is the intention of all of the code and notice wall signs to be equal in size and two color (background color vs. font color) to create a uniform appearance for the facility per the specification 10 14 00.

Generally we feel that 8" high (may vary) x 12" wide should be able to fit the required verbiage and Braille)

CODE and NOTICE SIGNS: We are not assembling a sign schedule as part of the bidding. The required signs are called for in the drawings. For purposes of the bid the interior and exterior wall signs for code and notice (8"h x 12"w) shall be of the same material.

Typically you will find near all of the toilet rooms, stairs towers, exterior ground floor pedestrian doors from main building. Majority of these code and notice signs are shown on the floor plans and a few are shown of the reflected ceiling plans. Toilet room door #102 will also require a door sign per the door schedule.

Section 10 14 00 item 2.03.C.3 Notice Sign regarding reclaimed rain water is being utilized in toilet fixture is eliminated from this scope (reclaimed rain water). Fire Dept. removed the rain harvest system from the scope of work and Architect and Engineer removed from the drawings prior to bidding. See Section D, Item 5, of this addendum.

EXTERIOR METAL SIGNS:

There are two exterior metal signs (one upper and one lower both on the south elevation).

Lower sign: see wall section 2 sheet A3.5

Upper sign: see detail 2 sheet A2.3

Q8. Who will be holding the contract for the commissioning authority for this project?

A8. The City has contracted separately with the commissioning authority.

Q9. The Door schedule has two doors with a note to provide $300 allowance for hardware. Please clarify these allowances are in addition to the $640,000 allowances on the bid form?

A9. Contractors are not required to carry any additional door allowance of $300 each gate beyond the listed allowances on the bid form for gates #201 and #217 A. If some additional door hardware is needed for these gates beyond what is specified then a portion the City assigned field orders will be used. With this addenda contractor no longer requires $600 allowance as shown in the remarks of door schedule sheet A 7.3 (48 of 166).

C. CLARIFICATIONS

1. Interior hose bibs shall be model 8121CR-LF manufactured by Acorn (or equal) which is Bent Hose Bibb with flange and include a vacuum breaker (Rough Chrome Plated finish). The exterior hose bibs on building shall include a vacuum breaker but remain with a keyed removable handle.

D. VOLUME 1

1. To Attachment E, Supplementary Special Provisions, Technicals, page 73, Section 01 11 00, Summary of Work, Item 1.06, Permits, Fees and Notices, Sub-item B, **DELETE** in its entirety and **SUBSTITUTE** with the following:

   B. The Contractor shall secure and pay for the building permit and for other permits and governmental fees, licenses and special inspections.

2. To Attachment E, Supplementary Special Provisions, Technicals, page 108, Section 01 45 00, Quality Control, Part 1, General, Item 1.04, Special Inspections, Sub-item A, **DELETE** in its entirety and **SUBSTITUTE** with the following:

   A. Costs for Special Inspection fees will be paid directly by the Contractor.

3. To Attachment E, Supplementary Special Provisions, Technicals page 315, Section 07 53 16, Single Ply Membrane Roofing, Part 1, General, Item 1.01, Summary, Sub-item A.2., **DELETE** in its entirety and **SUBSTITUTE** with the following:

   1. Fully operational photovoltaic grid-tied, electrical generating system.

4. To Attachment E, Supplementary Special Provisions, Technicals , page 471, Section 09 30 00, Tile, Part 2, Products, Item 2.02, Tile Materials, Sub-item A, General, **ADD** the following:

   The Architect has selected the following colors/tiles.

   Ceramic Wall Tile Bath/Toilet Rooms:

   Field wall: 2 x 2 “Cypress” 6537 Permatone by Dal Tile.

   Accent 1 Wall: 2 x 2 “Artic White” D 617 Keystone by Dal Tile.

   Accent 2 Wall: 2 x 2 to match floor tile.

   Ceramic Wall Tile Apparatus Room:

   4-1/4 x 4-1/4 “Fire Brick” Q093semi gloss by Dal Tile.

   Porcelain Floor Tile:

   12 x 12 “Shadow Pine” AL62 color body porcelain by Dal Tile.

   Porcelain Floor Tile base:

   6 x 12 to match floor tile.

5. To Attachment E, Supplementary Special Provisions, Technicals, page 510, Section 10 14 00, Signage, Part 2, Products, Item 2.03,Signage, Sub-item C.3., **DELETE** in its entirety.

6. To Attachment E, Supplementary Special Provisions, Technicals, page 550, Section 22 00 00, Plumbing, Part 2, Products, Item 2.4, Piping, **ADD** the following:

   G. Waste piping beyond the building footprint in the ground shall be Solid Core PVC DWV pipe and solvent weld fittings.

James Nagelvoort, Director
Public Works Department

Dated: *October 9, 2015*
San Diego, California

JN/AJ/lji

City of San Diego

CITY CONTACT: Eleida Felix Yackel, Contract Specialist,, **Email**: efelixyackel@sandiego.gov
Phone No. (619) 533-3449, **Fax No**. (619) 533-3633

ADDENDUM "B"

FOR

FIRE STATION NO. 17

BID NO.: **K-16-6142-DBB-3**
SAP NO. (WBS/IO/CC): **S-00783**
CLIENT DEPARTMENT: **1912**
COUNCIL DISTRICT: **9**
PROJECT TYPE: **BC**

BID DUE DATE:
2:00 PM
OCTOBER 27, 2015
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/Architect:

10·13·2015
1) Registered Engineer/Architect — Date — Seal:

CCBG ARCHITECTS INC.

10-13-2015
2) For City Engineer — Date — Seal:

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.**

B. BIDDER's QUESTIONS

Questions pertaining to Scope or Specifications

Q1. Drawing C-4 item # 36 and 46 call for saw cut and demo existing concrete. Drawing L1 shows the same area at the corner of Orange and Chamoune as item #1 (Existing to Remain. Clarify which drawing to follow? Also, clarify the trailer/coach can be a refurbished unit or must be a New unit.

A1. Drawing sheet C4 (sheet 7 of 166) shall govern over drawing sheet L1 (11 of 166). New concrete is required in these areas in lieu of the existing to remain. The Fire Deptartment wants a "new" CA state approved coach in lieu of a "refurbished" coach that meets CA state approval. It is also stated in the plans on sheet 140 under Scope Description to buy a new state approved coach.

Q2. Detail 6/A4.3 calls for a fixed P-Lam panel and calls for it to be 18" away from wall. There are no details on how this is to be held away from the wall. Provide some details on this cabinet and panel and connections to wall.

A2. The fixed P-Lam finished panel shown on detail 6 sheet A4.3 (40 of 166) can be flush mounted to the adjacent gyp bd. stud wall in lieu of 18" away – fastened with finish screws (color to match laminate) to the studs. We anticipate that a future T.V. wall bracket can be used to extend the future large T.V. beyond the face of the wall but not so far that it goes beyond the face of the lower cabinet.

Q3. The signage on this project is missing the details such as letter depth, dimensions, etc. Provide sign dimensions, letter depth, and mounting details.

A3. See Addendum A (see Q7/A7). There is enough information on the scaled documents for a qualified, experienced signage manufacturer to provide a proposal.

Q4. Detail 1/A8.5 shows Self Adhesive membrane waterproofing under the slab on grade. You can't do a self-adhered waterproofing under a slab on grade. For waterproofing under the slab on grade a different system will need to be selected. We also need to know how far away from the elevator walls this waterproofing extends. Clarify the waterproofing system.

This detail 1/A8.5 shows drainage board under the elevator mat foundation. Clarify drainage board is to be placed under the mat foundation of the elevator.

Detail 9/A4.0 shows waterproofing at the elevator but is different than what is shown on A8.5. Detail 8/A4.0 does not show any waterproofing. Clarify how these details work together and how far out the waterproofing will extend past the elevator walls.

Drawing plan S2.0 the Slab on Grade calls for 2" sand over 10 mil vapor barrier over 4"sand. The 8" SOG at the apparatus bay does not show any sand or vapor barrier. Clarify if the app bay has the same 2" over VB over 4" sand section as this will change the excavation.

A4. It is the intent of these documents to have additional water proofing protection for the limits elevator pit and the vertical walls of the elevator pit. There needs to be a satisfactory lap of waterproofing and use of bentonite at strategic joints (where it is difficult to obtain lap) as satisfactory to the manufacturer's rep. This waterproofing system shall extend 6" beyond the elevator pit walls.

The proposed water proof system manufacturer shall be as specified in detail 1 sheet A-8.5 (53 of 166).

Yes for the purposes of this bid a protection board assembly needs to be placed at the bottom of the pit slab – we will reconfirm with manufacturers literature prior to construction.

Sheet A4.0 does not exist in this set of documents.

Detail 9 sheet S 4.0 (69 of 166) shall have waterproofing similar to Architects detail.

Sheet S2.0 (62 of 166) the sub-grade below the Apparatus Room #109 slab shall not be the same as the conditioned space. It is different and does not require a vapor barrier under the slab for purposes of the bid as shown on the structural drawing.

Q5. Confirm that testing and inspection is the responsibility of the Contractor for the below sections:

1. 03 30 00 - Cast-In-Place Concrete:
2. 04 05 15 - Mortar and Masonry Grout
3. 04 22 00 – Concrete Masonry Units
4. 05 10 00 - Structural Metal Framing
5. 05 31 00 – Steel Deck.
6. 05 41 00 - Load-Bearing Metal Stud System
7. 07 92 00 - Joint Sealers

8. 31200 – Earthwork for Structures and Pavements:
9. Other testing as noted elsewhere in specifications.

A5. Yes, the special inspection for these and other areas as noted in Addendum A (see Q3/A3) are part of the general Contractor ’s scope of work and bid.

C. CLARIFICATIONS

1. “Energy Curb” that is currently specified on sheet A5.1 (44 of 166) details A, B, C, and D. This project is just not large enough for specified manufacturer to produce this specific curb. Model # E3co Energy PV anchor manufactured by Johns Manville (JM) or equal, is an acceptable alternative that can be submitted as part of the PV system, that still has to comply with the JM Manufacturer’s warranty and coverage terms as specified.

D. PLANS

1. To DRAWING numbered **36906-01-D**, **DELETE** in its entirety and **REPLACE** with page 6 of this Addendum**.**

2. To DRAWING numbered **36906-147-D**, **DELETE** in its entirety and **REPLACE** with page 7 of this Addendum.

James Nagelvoort, Director
Public Works Department

Dated: *October 15, 2015*
San Diego, California

JN/AJ/lji

CITY OF SAN DIEGO FIRE STATION #17
SAN DIEGO, CALIFORNIA

BUILDING CODE INFORMATION

BUILDING:	BUILDING TO BE CONSTRUCTED FIRE STATION
OCCUPANCY (CHAPTER 3):	B (LOBBY,RECEPTION,STAIR #105, OFFICE,CLEANROOM, LOCKERS, HOSE STORAGE, WATER ROOM) S-2 (APPARATUS, WORKROOM,STORAGE #107) R3 (DORMS, DAYROOM,TOILETS)
CONSTRUCTION TYPE (CHAPTER 6):	TYPE V-B W/SPRINKLER PROTECTION ALLOWING ADDED STORY AND HEIGHT
OCCUPANCY SEPARATIONS: (TABLE 508.3.3)	NON-SEPARATED

	B OCCUP.	S-2 OCCUP.	R3 OCCUP.
ALLOWABLE HEIGHT & STORIES (TABLE 503): SPRINKLER ADD STORY & 20' HEIGHT (504.2)	(40'+20')= 60 FEET (2 + 1) = 3 STORY	(40' + 20') = 60 FEET (2 + 1) = 3 STORY	(40' + 20") = 60 FEET 3 STORY
ACTUAL HEIGHT & STORIES (BUILDING):	47'-0" 3 STORY	47'-0" 3 STORY	47'-0" 3 STORY

	CONSTRUCTION TYPE V-B (B OCCUPANCY - MOST RESTRICTIVE)
EXTERIOR WALLS & OPENING PROTECTION (TABLES 601):	
EXTERIOR BEARING WALLS:	0 HOUR - FIRE PROTECTION RATING (UNLES RATED FOR FIRE SEPERATION DISTANCE TABLE 602)
INTERIOR BEARING WALLS:	0 HOURS U.O.N. ON PLANS
EXTERIOR NON-BEARING WALLS:	0 HOUR
INTERIOR NON-BEARING WALLS: (U.O.N. ON PLANS)	0 HOUR
MAX. AREA OF EXT. WALL OPENINGS: (PER SEC. 705.8 & TABLE 705.8)	
PROTECTED	0'-3' = NOT PERMITTED, 3'-5'=15%, 5'-10'=25%, 10'-15'=45%
UNPROTECTED (SPRINKLED)	0'-3' = NOT PERMITTED, 5'-10'=25%, 10'-15'=45%, 15'-20'=75%
EXTERIOR WALLS (TABLE 602) FIRE SEPARATION DISTANCE	1 HOUR FIRE PROTECTION RATING < 10' 0 HOUR FIRE PROTECTION RATING > 10'

	B OCCUPANCY (CALCULATE MOST RESTRICTIVE)
CBC ALLOWABLE AREA:	
BASIC ALLOWABLE AREA (AT), (TABLE 503):	9,000 SF (9K)
FRONTAGE INCREASE (SEC. 506.2) IF=(F/P-.25) X W/30: IF=AREA INCREASE FACTOR DUE TO FRONTAGE P=PERIMTER OF ENIRE BUILDING W=WIDTH OF PUBLIC WAY OR OPEN SPACE(SEC.502.1) F=BUILDING PERIMETER FRONTING ON A PUBLIC WAY OR 20 FOOT MINIMUM WIDTH OF OPEN SPACE	F=170', P=306', W=48' IF=((213/306)-.25)) X 48/30 IF=.44
SPRINKLER INCREASE (SEC. 506.3): IS=(2 X FOR MULTI-STORY, 3 X FOR SINGLE STORY) IS=AREA INCREASE FACTOR FOR SPRINKLERS	IS = 2 (YES SPRINKLERS)
AREA INCREASE (SEC. 506.1) A=AT+(AT X IF)+(AT X IS): A=ALLOWABLE AREA PER STORY AT=TABLE 503 AREA PER STORY IF=AREA INCREASE FACTOR (FRONTAGE) IS=AREA INCREASE FACTOR (SPRINKLER)	AT=9000, IF=.44, IS=0 A=9K+(9K X .44)+(9K X 0) A=9K+3.96K+0 = 12,960 SF
MULTI-STORY INCREASE (SEC. 506.4):	X 3 FOR THREE STORY BUILDING
TOTAL ALLOWABLE BUILDING AREA:	3 X 12,960 = 38,880 SF (12,960 SF MAX. EACH FLOOR)
	3RD FLOOR = 2963 <12,960 (OK) 2ND FLOOR = 3437 <12,960 (OK) 1ST FLOOR = 4357 SF <12,960 (OK)
ALLOWABLE AREA PER MIXED OCC. (SEC 506.4.1) BASED ON NON SEPARATED OCCUPANCIES (SEC 508.3.2) MOST RESTRICTIVE OCCUPANCY	ALLOWABLE AREA = 12,960 SF PER FLOOR. SEE CALCULATIONS ABOVE (BASED ON MOST RESTRICTIVE OCCUPANCY W/ BASIC ALLOWABLE AREA OF 9,000 SF)
ACTUAL BUILDING AREA (PER CBC):	10,757 SF ACTUAL

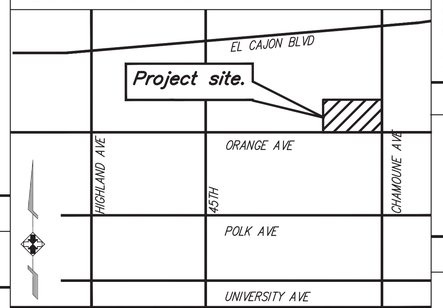
PROJECT DATA

PROJECT ADDRESS:	4206 CHAMOUNE AVE SAN DIEGO, CA 92115
APN:	471-301-09-12
PROPOSED USE:	FIRE SAFTEY FACILITY = "ESSENTIAL BUILDING FACILITY"
OCCUPANCY:	MIXED OCCUPANCY (FIRE STATION) R3 - S2 - B (NO OPEN WELDING ALLOWED IN THIS BUILDING)
OCCUPANT LOAD:	SEE LEGEND ARCH SHEET A0.2 FOR CALCULATIONS
TYPE OF CONSTRUCTION:	TYPE V-B SPRINKLED (NFPA 13)
PARKING:	SEE LEGEND ARCH SHEET A0.1 FOR CALCULATIONS
ZONING:	RM-1-1
LOT AREA:	.287 ACRES (12,502 SF)
ALLOWABLE BUILDING HEIGHT:	50'-0" PROPOSED HEIGHT: 47'-0"
SETBACKS:	FRONT YARD: 7' SIDE YARD INTERIOR: 8' REAR YARD: 5'
CBC CODE:	2010
SITE COVERAGE:	34.8%
STORIES:	THREE
SIZE:	4357 SQ. FT. GROUND/FIRST FLOOR 3437 SQ. FT. SECOND LEVEL =2963 BUILDING + 474 DECKS 2963 SQ. FT. THIRD LEVEL 10,757 SQ. FT. TOTAL WITH RELATED SITE WORK NOTE: STAIRS AND ELEVATOR COUNTED ON GROUND FLOOR ONLY
PUBLIC PARKING:	
ACCESSIBLE SPACES:	1
PRIVATE PARKING:	
STANDARD PARKING:	5
TANDUM PARKING:	4
TOTAL PARKING :	10

SEE LANDSCAPE PLAN FOR ADDITIONAL SITE DATA

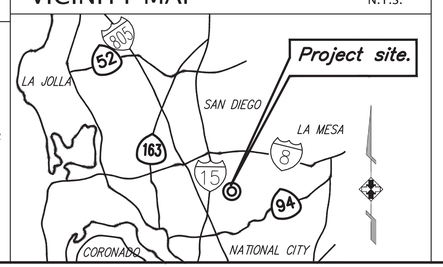
LOCATION MAP

N.T.S.



VICINITY MAP

N.T.S.



SHEET INDEX:

▫ FIRE ALARM SHEETS ARE FOR REFERENCE ONLY AND REPRESENT MINIMUM REQUIREMENTS. SEE DEFERRED SUBMITTAL INFO - THIS SHEET

PROJECT TEAM

CLIENT:
CITY OF SAN DIEGO
PUBLIC BUILDINGS AND PARKS DIVISION
525 B STREET 7th FLOOR
MAIL STATION #908A
SAN DIEGO, CA 92101
(619)533-6655
CONTACT: ELIF CETIN

CIVIL ENGINEER:
ALIDADE ENGINEERING
28441 RANCHO CALIFORNIA ROAD,
SUITE 100
TEMECULA, CA 92590
(951) 587-2020
CONTACT: LARRY DUTTON

LANDSCAPE ARCHITECT:
WIMMER YAMADA AND CAUGHEY
3067 FIFTH AVENUE
SAN DIEGO, CA 92103-5840
(619) 232-4004
CONTACT: PATRICK CAUGHEY, ASLA

ARCHITECT:
CCBG ARCHITECTS INC.
3677 VOLTAIRE ST
SAN DIEGO, CA 92106
(619) 234-2212
E-MAIL ddavis@ccbg-arch.com
CONTACT: DARROLD DAVIS

STRUCTURAL ENGINEER:
STRUCTURAL ENG. SOLUTIONS.
45901 SANDIA CREEK DRIVE
TEMECULA,CA 92590
(951) 699-2666
CONTACT: PAUL FEATHER

MECH/PLUMBING:
ELEN CONSULTING
3456 CAMINO DEL RIO NORTH SUITE 101
SAN DIEGO, CA 92108
(619) 550-1085 x.119
CONTACT: LINDA ALEXANDER

ELECTRICAL ENGINEERING:
BSE ENGINEERING, INC.
10680 TREENA STREET SUITE 100
SAN DIEGO, CA 92131
(858) 279-2000
CONTACT: ALAN J. BROWN

GEOTECHNICAL ENGINEER
NINYO & MOORE
5710 RUFFIN ROAD
SAN DIEGO, CA 92123
(858) 576-1000
CONTACT: MADAN CHIRUMALLA

COMMISIONING AGENT
TO BE DETERMINED

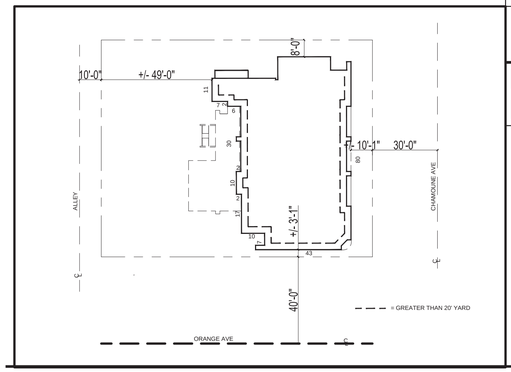
TESTING AGENCY
TO BE DETERMINED

LEED™ REGISTERED PROJECT
FIRE STATION NO. 17 IS A REGISTERED PROJECT #10000022739 WITH THE U.S. GREEN BUILDING COUNCIL & LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED™) GREEN BUILDING RATING SYSTEM. PROJECT IS PURSUING SILVER LEVEL OF CERT.

UTILITY AGENCIES

WATER: CITY OF SAN DIEGO
SEWER: CITY OF SAN DIEGO
ELECTRIC: SDG&E
PHONE: AT&T
TV: COX/TIME WARNER

BUILDING CODE SITE DIAGRAM



SPECIAL INSPECTION

1. SEE STRUCTURAL SHEET S1.1 FOR ADDITIONAL SCOPE AND INFO AND REQUIREMENTS OF SPECIAL INSPECTION
2. INTUMESCENT PAINTING THICKNESS GROUND FLOOR
3. SPRAY ON FIRE PROTECTION COATING SECOND FLOOR

DEFERED SUBMITTALS INSTRUCTIONS

IT IS UNDERSTOOD THAT PLANS FOR THIS PROJECT AT THIS TIME HAVE BEEN REVIEWED FOR COMPLIANCE WITH APPLICABLE STATE AND CITY REGULATIONS AND THAT THIS PROJECT AS A WHOLE HAS BEEN APPROVED BY THE CITY WITH EXCEPTION OF THE DEFERRED ITEMS LISTED.

PLANS FOR DEFERRED SUBMITTAL ITEMS SHALL BE SUBMITTED IN A TIMELY MANNER THAT ALLOWS A MINIMUM OF 35(THIRTY-FIVE) WORKING DAYS FOR INITIAL PLAN REVIEW ALL COMMENTS RELATED TO THE DEFERRED SUBMITTAL MUST BE ADDRESSED TO THE SATISFACTION OF PLAN CHECK DIVISION PRIOR TO APPROVAL OF THE SUBMITTAL.

THE FOLLOWING SUBMITTALS (DRAWINGS AND CALCULATIONS WILL BE PROVIDED BY GENERAL CONTRACTOR AND CONTRACTOR'S LICENSED ENGINEER AS PART OF THIS SCOPE OF WORK. CONTRACTOR SHALL SUBMIT DEFERRED SUBMITTAL FOR REVIEW (5 DAYS) PRIOR TO SUBMITTING TO CITY OF SAN DIEGO(30 DAYS).

DECLRATION OF RESPONSIBLE IN CHARGE

I HEREBY DECLARE THAT I AM THE ARCHITECT OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS. I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ARCHITECT OF WORK OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

DA Davis 7-16-15

DARROLD DAVIS CL#19366 EXP 11.30.15

SCOPE DESCRIPTION

CONSTRUCTION OF NEW 3-STORY FIRE STATION AND RELATED SITE AMENITIES - EXISTING FIRE STATION WILL BE DEMOLISHED AS PART OF THIS SCOPE OF WORK & SEPARATE DEMO PERMIT
4357 SQ. FT. GROUND/FIRST FLOOR
3437 SQ. FT. SECOND LEVEL =2963 BUILDING + 474 DECKS
2963 SQ. FT. THIRD LEVEL

10,757 SQ. FT. BUILDING TOTAL WITH ADDITIONAL RELATED SITE WORK

REQUIRED DEFERRED SUBMITTALS

1. ALL FIRE PROTECTION EQUIPMENT FOR SITE AND BUILDING - "PLANS FOR FIRE SPRINKLER AND FIRE ALARM SYSTEMS PER NFPA 13 TO BE APPROVED BY THE LOCAL FIRE PROTECTION AUTHORITY PRIOR TO INSTALLATION. OBTAIN A PERMIT FROM THE FIRE DEPARTMENT FOR THE FIRE SPRINKLER SYSTEM.

2. INTERIOR (METAL PAN-CONCRETE FILLED) STAIR AND LANDING SYSTEM SEE ADDITIONAL INFO SHEET S1.1 FOR STAIR SYSTEM DEFERRAL

3. FINAL DESIGN AND CALCULATIONS FOR PHOTOVOLTAIC ROOF SYSTEM AS SPECIFIED AND SHOWN IN DOCUMENTS.

4. CONSTRUCTION ACTIVITY PERMIT BY CAL-OSHA INCLUDING $50 FEE CHECKLIST OF REQUIREMENTS AVAILABLE FROM ARCHITECT IF REQUESTED.

5. MANUFACTURERS DESIGN AND CALCULATIONS FOR VERTICAL TRANSLUCENT PANEL SYSTEM (WINDOW K).

NOTE: ALL DEFERRED SUBMITTALS SHALL BE PROVIDED BY SELECTED CONTRACTOR'S TEAM AND MUST BE REVIEWED BY THE ARCHITECT OR ENGINEER OF RECORD PRIOR TO BEING SUBMITTED TO THE CITY OF SAN DIEGO FOR REVIEW AND APPROVAL. A NOTATION ON THE PLANS OR A LETTER OF APPROVAL INDICATING THAT THE DEFERRED SUBMITTAL DOCUMENTS HAVE BEEN REVIEWED AND THEY HAVE BEEN FOUND TO BE IN GENERAL CONFORMANCE WITH THE DESIGN OF THE BUILDING MUST BE INCLUDED WITH THE SUBMITTAL. DEFERRAL OF ANY SUBMITTAL ITEMS SHALL HAVE PRIOR APPROVAL OF THE BUILDING OFFICIAL. (CBC SEC. 106.3.4.2)

CONSTRUCTION CHANGE / ADDENDUM

CHANGE	DATE	AFFECTED OR ADDED SHEET NUMBERS	APPROVAL NO.
B	10.15.15	147	

WARNING
0 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

CONSULTANT
CCBG Architects, Inc.
Phoenix San Diego
3677 VOLTAIRE ST. San Diego, California 92106
T: 619-234-2212

LICENSED ARCHITECT DARROLD LEE DAVIS No. 19366 Ren. 11-30-15 STATE OF CALIFORNIA

PLANS FOR THE CONSTRUCTION OF
FIRE STATION NO. 17
COVER SHEET

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 1 OF 166 SHEETS

WBS S-00783

APPROVED: ELIF CETIN, FOR CITY ENGINEER — DATE 9/3/15 — I.D.# C60990

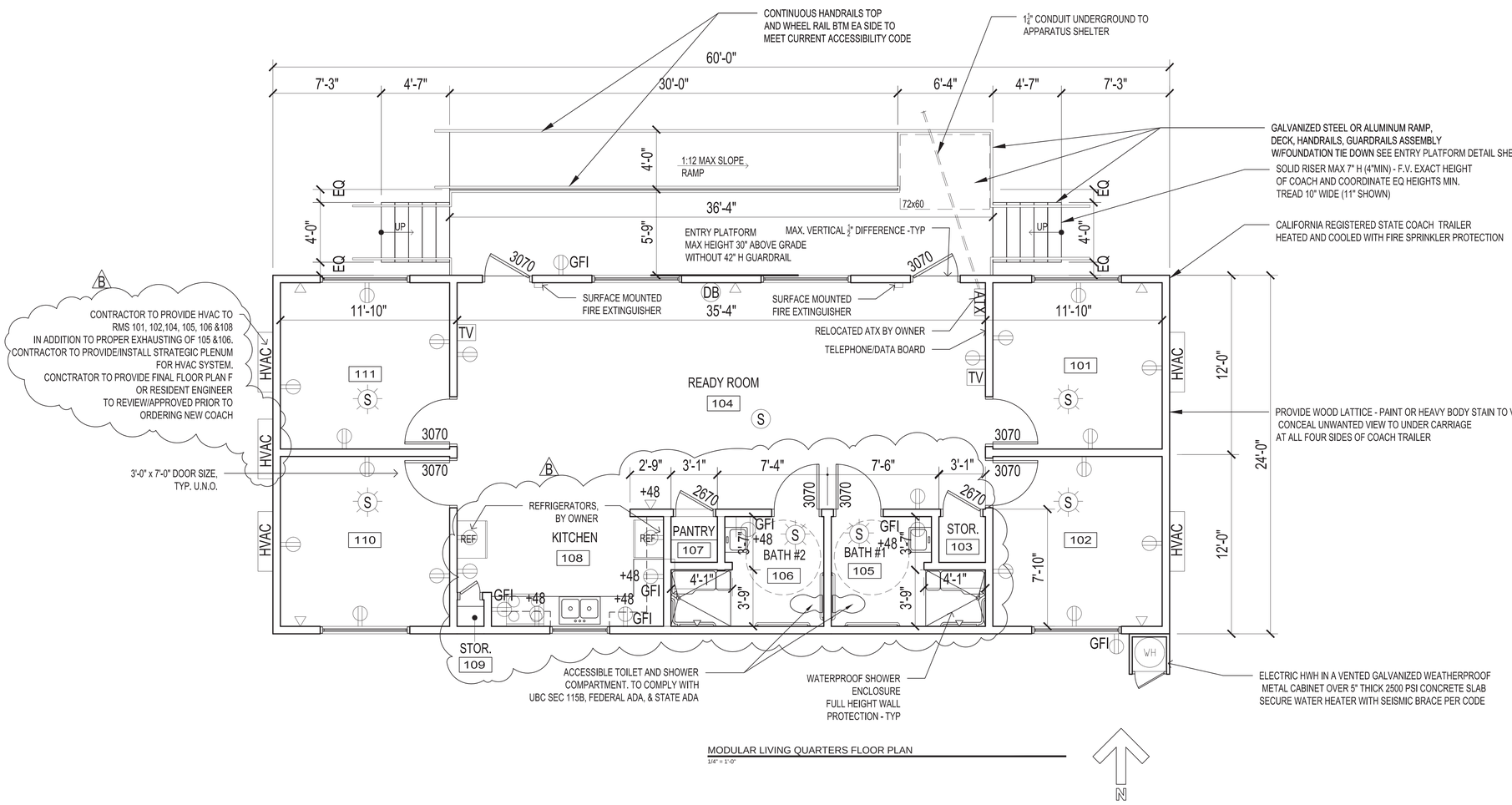
SUBMITTED BY: ROWAIDA JADAN, PROJECT MANAGER
CHECKED BY: JASIAH NEFF, PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	CCBG			
⚠ ADDENDUM B	CCBG		10/15/15	

214-1737 CCS27 COORDINATE
6298407-1854444 CCS83 COORDINATE
36906- 01-D

CONTRACTOR _____ DATE STARTED _____
INSPECTOR _____ DATE COMPLETED _____

SAN DIEGO FIRE STATION NO. 17



MODULAR LIVING QUARTERS FLOOR PLAN
1/4" = 1'-0"

OCCUPANT LOAD:

DORM ROOM 600 SQ. FT./200 SQ. FT. PER OCCUPANT = 3 OCCUPANTS
USE 4 OCCUPANTS MAX.

NOTES:

1. CONTRACTOR SCOPE ON THIS MODULAR TRAILER IS TO PROVIDE AND INSTALL CA. STATE REGISTERED TRAILER WITH SPRINKLER PROTECTION AND THIS FLOOR PLAN ON THIS TEMPORARY SITE. CONTRACTOR TO PROVIDE ENGINEERING AND CALCULATIONS FROM CA LICENSED CIVIL ENGINEER FOR FOUNDATION/TIE DOWN FOR BOTH ENTRY RAMP,ENTRY PLATFORM STAIRS AND MODULAR TRAILER. CONTRACTOR'S TEAM SHALL INCLUDE IN THEIR SCOPE SUBMITTAL OF FOUNDATION/TIE DOWN CALCULATIONS AND DETAILS FOR DEFERRED SUBMITTAL IF REQUESTED BY THE FIRE DEPARTMENT TO THE CITY OF SAN DIEGO.

2. OPERABLE WINDOWS (TYP OF EA WINDOW IN ROOMS 101, 102, 110 AND 111) SHALL HAVE A NET CLEAR EMERGENCY ESCAPE OPENING OF 5.7 SQ. FT. A MINIMUM HEIGHT OPENING OF 24" BY MINIMUM WIDTH OF 20". THE SILL SHALL BE LESS THAN 44" ABOVE FINISH FLOOR.

3. PROVIDE/INSTALL SMOKE DETECTOR POWERED WITH LINE VOLT ELECTRICITY ALONG WITH BATTERY BACKUP IN ROOMS 101, 102, 104, 110, AND 111. SMOKE DETECTORS SHALL BE INTER-CONNECTED SO AS IF ONE DETECTOR IS ACTIVATED, ALL DETECTORS WILL BE ACTIVATED INSTANTLY.

4. INTERIOR FINISHES BE STATE APPROVED AND MEET FLAME RESISTANCE STANDARDS COLORS SHALL BE SELECTED BY ARCHITECT FROM MANUFACTURER STANDARD COLORS
FLOORING: SHEET VINYL/VCT
WALLS: VINYL COVERED GYPSUM
CEILINGS: SUSPENDED ACOUSTICAL TILES AND GRID SYSTEM
CEILINGS: WATERPROOF/MOLD RESISTANT/FRP AT WET LOCATION SHOWER

POWER SYMBOLS

⊖	DUPLEX RECEPTACLE MTD 18" TO CENTER UNLESS NOTED
GFI	GFI DUPLEX RECEPTACLE MTD 18" TO CENTER UNLESS NOTED
⋈	TELEPHONE/DATA WITH ¾" CONDUIT TERMINATE INTO ACCESSIBLE COILING WITH INSULATED BUSHING
TV	TELEVISION SYSTEM W/JACK WALL MTD +12" U.O.N. COAX CABLE HOME RUN BACK TO TELEPHONE BOARD
DB	WIRELESS DOORBELL CHINES SEE SITE ELECTRICAL FOR ADDITIONAL INFO

SIGNAL SYMBOLS

(S)	CEILING MOUNTED SPEAKER WITH LOCAL VOLUME CONTROL EA ROOM W/ INDIVIDUAL ¾" CONCEALED CONDUITS OVER INACCESSIBLE CEILING OR NO FINISHED CEILING HOME RUN BACK TO COMM/TEL BD MODEL #XXXXXX MANUFACTURED BY XXXX
(S)	CEILING MOUNTED LED SPEAKER WITH LOCAL VOLUME CONTROL EA ROOM W/ INDIVIDUAL ¾" CONCEALED CONDUITS OVER INACCESSIBLE CEILING OR NO FINISHED CEILING HOME RUN BACK TO COMM/TEL BD MODEL #XXXXXX MANUFACTURED BY XXXX
(S)	SURFACE MOUNTED SPEAKER WITH LOCAL VOLUME CONTROL EA ROOM W/ INDIVIDUAL ¾" CONCEALED CONDUITS OVER INACCESSIBLE CEILING OR NO FINISHED CEILING HOME RUN BACK TO COMM/TEL BD MODEL #XXXXXX MANUFACTURED BY XXXX
MS	SURFACE MOUNTED MESSAGE SIGN(5'-0" A.F.F.) WITH INDIVIDUAL ¾" CONCEALED CONDUITS OVER INACCESSIBLE CEILING OR NO FINISHED CEILING HOME RUN BACK TO COMM/TEL BD MODEL #XXXXXX MANUFACTURED BY XXXX
ATX	"BRAIN" COMPONENT OF OWNERS ALERTING SYSTEM RELOCATED (E) SALVAGED COMPONENT FROM (E) FIRE STATION 17 AT 4206 CHAMOUNE AVE

PROJECT NO.	1015
DRAWN	MR
CHECKED	DD
APPROVED	DD
ISSUED	7.16.15

CCBG Architects, Inc.

Phoenix San Diego

3677 VOLTAIRE ST. San Diego, California 92106

T: 619-234-2212

CITY OF SAN DIEGO FIRE DEPARTMENT

TEMP FS 17 MOD TRAILER FLOOR PLAN | A2.1

PLANS FOR THE CONSTRUCTION OF FIRE STATION NO. 17 TEMPORARY FACILITY

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 147 OF 166 SHEETS

WBS S-00783

APPROVED: ELF CETN 9/3/15
APPROVED: DEPUTY DIRECTOR 060990

SUBMITTED BY: ROWAIDA JADAN, PROJECT MANAGER
CHECKED BY: JASIAH NEFF, PROJECT ENGINEER
210-1731 CCS27 COORDINATE
6292407-1850444 CCS83 COORDINATE
36906-147-D

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	CCBG			
B ADDENDUM B	CCBG		10/15/15	

CONTRACTOR
INSPECTOR
DATE STARTED
DATE COMPLETED

B REVISED HVAC AND FLOOR PLAN

ADDENDUM B

CONSTRUCTION CHANGE / ADDENDUM

CHANGE	DATE	AFFECTED OR ADDED SHEET NUMBERS	APPROVAL NO.

WARNING
0 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

CONSULTANT

LICENSED ARCHITECT — REGISTERED PROFESSIONAL ENGINEER — No. 19099 — 10-31-15 — STATE OF CALIFORNIA

FIRE STATION NO 17 – TEMP
SAN DIEGO

City of San Diego

CITY CONTACT: Eleida Felix Yackel, Contract Specialist,, **Email**: efelixyackel@sandiego.gov
Phone No. (619) 533-3449, **Fax No**. (619) 533-3633

ADDENDUM "C"

FOR

FIRE STATION NO. 17

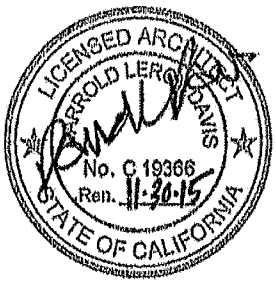
BID NO.: **K-16-6142-DBB-3**
SAP NO. (WBS/IO/CC): **S-00783**
CLIENT DEPARTMENT: **1912**
COUNCIL DISTRICT: **9**
PROJECT TYPE: **BC**

BID DUE DATE:

2:00 PM
OCTOBER 27, 2015
CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
1010 SECOND AVENUE, 14th FLOOR, MS 614C
SAN DIEGO, CA 92101

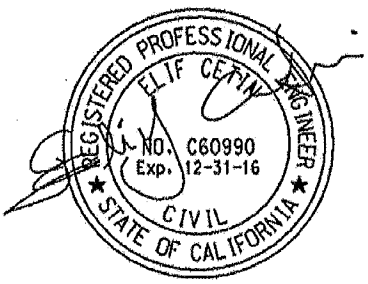
ENGINEER OF WORK

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



10·13·2015
1) Registered Engineer/Architect — Date — Seal:
CCBG ARCHITECTS INC.

10-13-2015
2) For City Engineer — Date — Seal:



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. VOLUME 2

1. To Bidding Documents, pages 10 through 12, PROPOSAL (BID), **DELETE** in their entirety and **SUBSTITUTE** with pages 4 through 6 of this Addendum.

2. To Bidding Documents, page 13, List of Subcontractors, **DELETE** in its entirety and **SUBSTITUTE** with page 7 of this Addendum.

3. To Bidding Documents, page 14, Named Equipment/Material Supplier List, **DELETE** in its entirety and **SUBSTITUTE** with page 8 of this Addendum.

James Nagelvoort, Director
Public Works Department

Dated: *October 21, 2015*
San Diego, California

JN/AJ/lji

PROPOSAL (BID)

The Bidder agrees to the construction of **FIRE STATION NO. 17** for the City of San Diego, in accordance with these contract documents for the prices listed below. 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 to Award of the Contract. 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 e.g., bond and insurance.

Item	Quantity	Unit	NAICS	Payment Reference	Description	Unit Price	Extension
BASE BID							
1	1	LS	236220	Tech. Spec/ Plans	Construction of Fire Station No. 17 and Related Site Improvements, including but not limited to Photo Voltaic Roof System, and Demolition the existing Fire Station at 4206 Chamoune Ave, San Diego, CA, 92115		$
2	1	LS	236220	Tech. Spec/ Plans	Fire Station No. 17 Temporary Facility at 4000 41st St., San Diego CA, 92115		$
3	1	AL	236220	7-5.3	Building Permits for Permanent and Temporary Station: Mechanical, Plumbing and Electrical and Fees Related to Fuel Tank Permit,including City of San Diego, Water & SewerCapacities and Connection Fees - Type I		$100,000.00
4	1	AL	238210	Tech. Spec/ Plans	SDG&E Service Fee, Dry Utilities Connections, Pack Bell, AT&T and Time Warner - Type I		$70,000.00
5	1	AL	236220	Tech. Spec/ Plans	FF & E (Temporary and Permanent Facilities) - Type I		$120,000.00
6	1	LS	524126	2-4.1	Bond (Payment and Performance)		$
7	1	LS	237990	701-13.9.5	Water Pollution Control Program Implementation		$
8	1	LS	236220	701-13.9.5	Water Pollution Control Program Development		$
9	1	AL		9-3.5	Field Orders - Type II		$350,000.00
						TOTAL BASE BID:	**$**

TOTAL BID PRICE FOR BID (Items 1 through 9 inclusive) amount written in words:

_____

The Bidder is to acknowledge within the bid the receipt of any addenda that were issued. If an addendum was issued by the City and not acknowledged by the Bidder, the bid may be deemed non-responsive. The following addenda have been received and are hereby acknowledged: __

The names of all persons interested in the foregoing proposal as principals are as follows:

_____

_____

_____

_____

IMPORTANT NOTICE: If Bidder or other interested person is a corporation, state secretary, treasurer, and manager thereof; if a co-partnership, state true name of firm, also names of all individual co-partners composing firm; if Bidder or other interested person is an individual, state first and last names in full.

Bidder:_____

Title: _____

Business Address: _____

Place of Business: _____

Place of Residence: _____

Signature: _____

NOTES:

A. The City shall determine the low Bid based on the Base Bid alone.

B. Prices and notations shall be in ink or typewritten. All corrections (which have been initiated by the Bidder using erasures, strike out, line out, or "white-out") shall be typed or written in with ink adjacent thereto, and shall be initialed in ink by the person signing the bid proposal.

C. Failure to initial all corrections made in the bidding documents may cause the Bid to be rejected as **non-responsive** and ineligible for further consideration.

D. Blank spaces must be filled in, using figures. Bidder's failure to submit a price for any Bid item that requires the Bidder to submit a price shall render the Bid **non-responsive** and shall be cause for its rejection.

E. Unit prices shall be entered for all unit price items. Unit prices shall not exceed two (2) decimal places. If the Unit prices entered exceed two (2) decimal places, the City will only use the first two digits after the decimal points without rounding up or down.

F. All extensions of the unit prices bid will be subject to verification by the City. In the case of inconsistency or conflict between the product of the Quantity x Unit Price and the Extension, the product shall govern.

G. In the case of inconsistency or conflict, between the sums of the Extensions with the estimated total Bid, the sum of the Extensions shall govern.

H. Bids shall not contain any recapitulation of the Work. Conditional Bids will be rejected as being **non-responsive**. Alternative proposals will not be considered unless called for.

I. Subcontractors' License Number must be filled in. Failure to provide the information specified may deem the bidder **non-responsive**.

LIST OF SUBCONTRACTORS

In accordance with the requirements of the "Subletting and Subcontracting Fair Practices Act", Section 4100, of the California Public Contract Code (PCC), the Bidder is to list below the name, address and license number of each Subcontractor who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement, in an amount of or in excess of 0.5% of the Contractor's total Bid. Failure to comply with this requirement may result in the Bid being rejected as non-responsive. The Contractor is to list only one Subcontractor for each portion of the Work. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percentage of the Work to be performed with the Bidder's own forces. The Bidder is to also list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which the Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED ②	CHECK IF JOINT VENTURE PARTNERSHIP
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____							
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____							

① As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC	San Diego Regional Minority Supplier Diversity Council	SRMSDC
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.

NAMED EQUIPMENT/MATERIAL SUPPLIER LIST

The Bidder seeking the recognition of equipment, materials, or supplies obtained from Suppliers towards achieving any mandatory, voluntary, or both subcontracting participation percentages is to list the Supplier(s) on the Named Equipment/Material Supplier List. The Named Equipment/Material Supplier List, at a minimum, is to have the name, locations (City) and the **DOLLAR VALUE** of the Suppliers. The Bidder will be credited up to 60% of the amount to be paid to the Suppliers for such materials and supplies unless vendor manufactures or substantially alters materials and supplies in which case 100% will be credited. The Bidder is to indicate (Yes/No) whether listed firm is a supplier or manufacturer. In calculating the subcontractor participation percentages, vendors/suppliers will receive 60% credit of the listed **DOLLAR VALUE**, whereas manufacturers will receive 100% credit. If no indication provided, listed firm will be credited at 60% of the listed dollar value for purposes of calculating the Subcontractor Participation Percentage, Suppliers will receive 60% credit of the listed **DOLLAR VALUE**, whereas manufacturers will receive 100% credit. If no indication provided, listed firm will be credited at 60% of the listed **DOLLAR VALUE** for purposes of calculating the subcontractor participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF VENDOR/SUPPLIER	MATERIALS OR SUPPLIES	DOLLAR VALUE OF MATERIAL OR SUPPLIES (MUST BE FILLED OUT)	SUPPLIER (Yes/No)	MANUFACTURER (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED ②
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____						
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____						

① As appropriate, Bidder shall identify Vendor/Supplier as one of the following and shall include a valid proof of certification (except for OBE,SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Vendor/Supplier is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC	San Diego Regional Minority Supplier Diversity Council	SRMSDC
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification